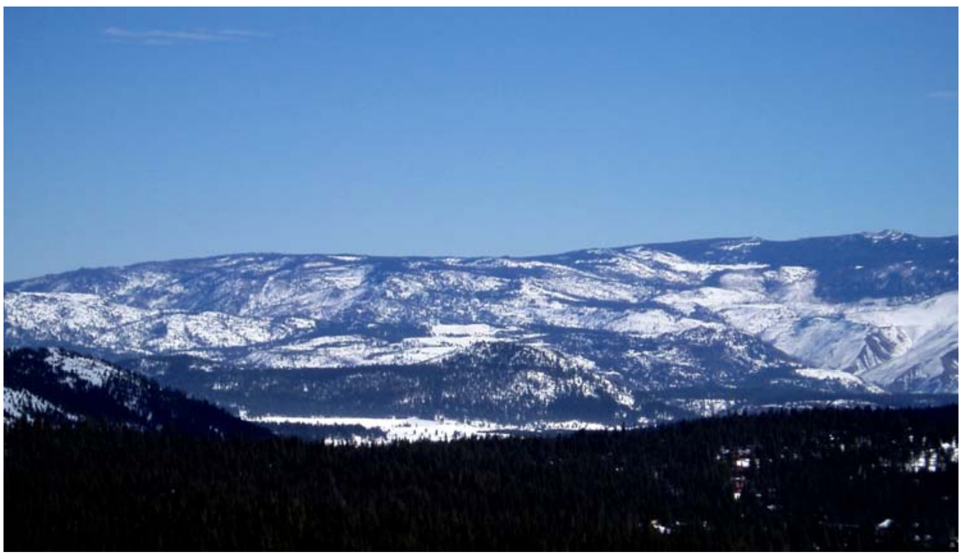
TRUCKEE WATER SYSTEM
2015 URBAN WATER MANAGEMENT PLAN



Adopted June 1, 2016

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SECTION 1

INTRODUCTION

SECTION 1
INTRODUCTION

The California Water Code requires all urban water suppliers within the state to prepare urban water management plans and update them every five years. These plans satisfy the requirements of the Urban Water Management Planning Act of 1983 (Act) including amendments that have been made to the Act. Sections 10610 through 10656 of the California Water Code detail the information that must be included in these plans, as well as who must file them. Appendix A contains the text of the Act.

Amendments to the Act now require that total projected water use be compared to water supply sources over the next 20 years in 5-year increments. The Act also requires the information be shown for a single dry water year and multiple dry water years. Additionally, the Act requires that all plans include a water recycling analysis that includes a description of the wastewater collection and treatment system within the agency's service area along with current and potential recycled water uses.

According to the Act, "The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level." The Act requires that each urban water supplier, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually, shall prepare, update and adopt its urban water management plan (UWMP) at least once every five years.

In 2009, the Water Conservation Act of 2009 (as known as SB X7-7) was adopted. This legislation created additional requirements regarding urban water management plans. These requirements are documented in Section 10608 of the California Water Code. Appendix B contains the text of SB X7-7.

PUBLIC PARTICIPATION

In accordance with the Act, the Truckee Donner Public Utility District (District) is required to make the plan available for public review and to hold a public hearing prior to adoption of the UWMP.

This public hearing was held at the District's regularly scheduled Board Meeting on June 1, 2016. Notices of the meeting were published in the Sierra Sun on May 18 and May 25, 2016. Letters were mailed directly to the following agencies advising them of the public hearing:

- Town of Truckee
- Nevada County
- Placer County
- Northstar Community Services District (NCSD)
- Truckee Sanitation District
- Tahoe-Truckee Sanitation Agency

Prior to the meeting, draft copies of the UWMP were made available for public review at the District's office at 11570 Donner Pass Road, Truckee, California and at the Truckee Branch of the Nevada County Library at 10031 Levon Avenue, Truckee, California.

INTERAGENCY COORDINATION

In accordance with the Act, the District is required to coordinate preparation of its UWMP with other local agencies. In the past, the District has worked cooperatively with NCSD and the Placer County Water Agency (PCWA) to study the available water supplies in the Truckee and Martis Valley area. Two major studies that were jointly funded by all three agencies have been completed:

- ***Ground Water Availability In The Martis Valley Ground Water Basin, Nevada And Placer Counties, California,*** prepared by Nimbus Engineers, Reno, Nevada, March 2001.

- ***Martis Valley Groundwater Management Plan,*** prepared by Brown and Caldwell and Balance Hydrologics, Reno, Nevada, April 2013.

Preparation of the April 2013 document also included development of a finite element model for the Martis Valley Groundwater Basin by the Desert Research Institute. Development of this model was funded by the three local agencies and the US Bureau of Reclamation. This effort is documented in:

- ***Integrated Surface and Groundwater Modeling of Martis Valley, California, for Assessment of Potential Climate Change Impacts on Basin-Scale Water Resources,*** prepared by Desert Research Institute, Reno, Nevada, April 2015.

In October 2015, NCSD took ownership of the PCWA Zone 4 water system in the Martis Valley and PCWA no longer has a local presence. The District anticipates that it will continue to work cooperatively with NCSD on issues related to the Martis Valley Groundwater Basin in the future.

ENVIRONMENTAL REVIEW

The preparation of an Urban Water Management Plan is specifically exempt from the California Environmental Quality Act (CEQA). Therefore, a CEQA review has not been performed in conjunction with the preparation of this document. However, the exemption only applies to preparation of the UWMP and the District will have to conduct environmental reviews in order to physically construct any of the projects described in this UWMP.

PLAN ADOPTION

The District's Board of Directors adopted the 2015 Urban Water Management Plan on June 1, 2016. A copy of the adopting resolution is included in Appendix E.

FORMAT OF THE PLAN

The State of California has developed a number of standard tables to be included in an UWMP. The format of this UWMP differs from that of the District's previous plans (2005 and 2011) in order to include these standard tables.

In a number of cases, these standard tables include or discuss data that is not relevant to the District. One example is water used for “saline water intrusion barriers.” These unmodified standard tables are included in order to comply with State reporting and filing requirements.

SUBJECT OF THE PLAN

The District operates two water systems in the Truckee area: the Hirschdale System (PWS CA2910010) and the Truckee System (PWS CA2910003). The Truckee System serves 12,473 accounts. The Hirschdale System serves 24 accounts. The two systems are physically separate and not interconnected.

Based upon guidance from the California Department of Water Resources, an UWMP is not required for the Hirschdale system. Therefore, this document addresses the Truckee System only.

SECTION 2

SERVICE AREA

SECTION 2
SERVICE AREA

The Truckee Donner Public Utility District (District) provides water service to portions of the town of Truckee, California, along with adjacent unincorporated areas of Nevada and Placer Counties. The District operates two water systems in the Truckee area: the Hirschdale System (PWS CA2910010) and the Truckee System (PWS CA2910003). The general location of the town of Truckee is given in **Figure 2-1** and the boundaries of the District's water system service areas are shown in **Figure 2-2**.

DISTRICT HISTORY AND BACKGROUND

Public water service in the Truckee area began in 1880, when the Schaeffer Lumber Company developed the Tonini Springs to serve what is now downtown Truckee. In 1883, the McGlashen infiltration gallery was constructed, along with a transmission system to convey water to the downtown area. In 1885, the adjacent McGlashen Springs was developed.

In 1927, the Truckee Donner Public Utility District was formed to provide electrical service to the Truckee area. In 1935, the District began providing water service with the purchase of the McGlashen water system. In 1943, the Southside Spring was acquired by the District and in 1953, the Tonini Springs water system was obtained by the District.

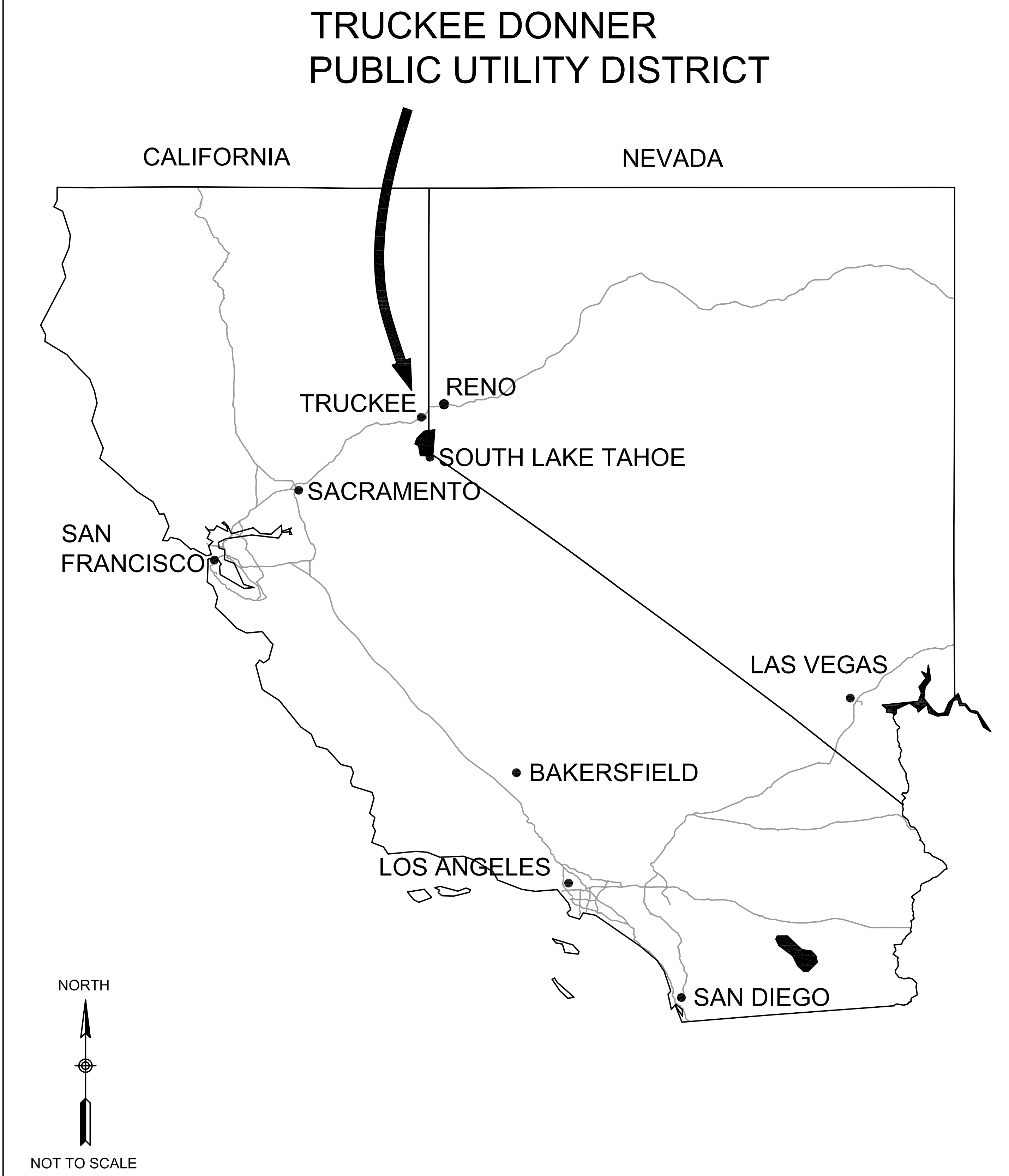
Originally, the District's water system provided service to only the downtown area. The system was expanded to serve the Gateway and Meadow Park areas in the late 1940s. Significant expansion of the District's service area occurred in the 1960s as new residential subdivisions were constructed in the area.

Service was extended to the Olympic Heights area in the early 1960s, and the Sierra Meadows area in the mid-1960s. The Tahoe Donner, Prosser Lakeview and Ponderosa Palisades areas were developed in the late 1960s, and the Armstrong area in the late 1970s.

Prior to 2001, there were two other water purveyors in the Truckee area. In the Summer of 2001, the District took possession of the Donner Lake Water System. In February of 2002, the District took possession of the Glenshire Mutual Water Company's system.

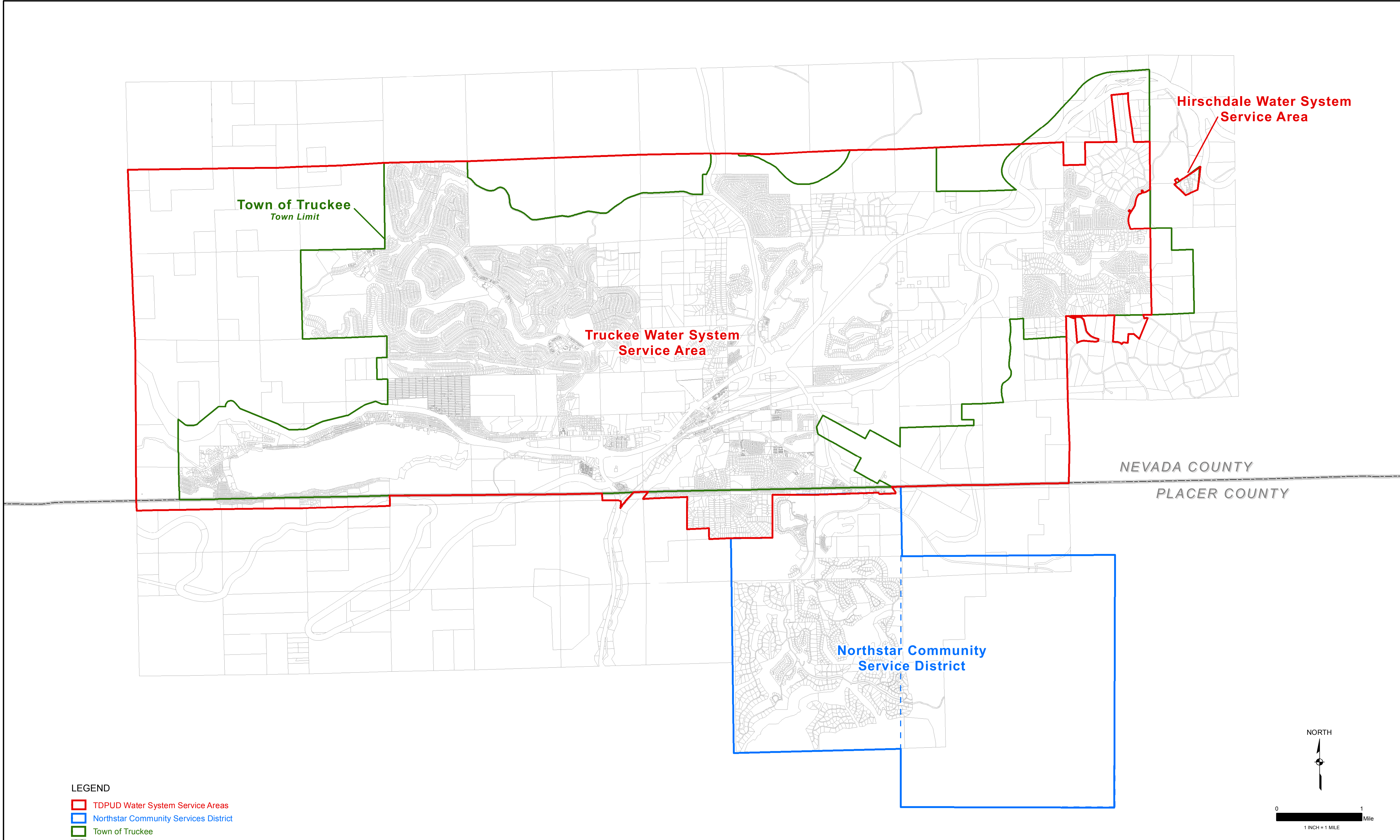
Significant development occurred during the 2000s. New residential developments included Gray's Crossing, Old Greenwood, Spring Creek and Winter Creek. Non-residential development included the Alder Creek Middle School, Pioneer Commerce Center and the Sierra College campus. A large number of infill homes were also constructed on vacant lots in the older subdivisions.

From 2008 to the present, there has been minimal new development within the service area and growth has mainly involved infill construction of new homes within previously created subdivisions.



TRUCKEE DONNER
Public Utility District

Figure 2-1
Location Map



TRUCKEE DONNER PUBLIC UTILITY DISTRICT

Figure 2-2
Water System Service Areas

CLIMATE
The District's service area is located in the eastern Sierra Nevada mountains at the east end of Donner Pass. Water system service elevations range from 5700 to over 7300 feet above mean sea level. The area receives substantial amounts of precipitation during the winter as both rain and snow. Average high temperatures range from the low 80s in Summer to the low 40s in Winter. Average low temperatures range from the low 40s in Summer to the mid-teens in Winter.

CURRENT AND PROJECTED POPULATION
The Town of Truckee and surrounding areas have been experiencing slow to moderate growth over the past 50 years. Population within the town has increased from 5,539 in 1980 to a current population of 16,211. **Table 2-1** shows this historic population data.

The Town of Truckee's current ***General Plan*** was adopted in 2006. The ***General Plan*** projects population growth in the area to occur at a rate of two percent per year, eventually reaching a buildout population of about 28,300 permanent residents. Based upon the projected growth rate in the ***General Plan***, historic and projected population totals are given in **Figure 2-3**, with the buildout population occurring in 2044. The projected population is summarized in **Table 2-2**.

The economy of Truckee and the surrounding area relies upon tourism as the main industry. There are a significant number of residential units used as vacation homes that are not occupied on a full-time basis with estimates ranging as high as 75 to 80 percent for certain portions of the service area. The ***General Plan*** cites an estimate that 54 percent of all housing units are occupied full-time on a town-wide basis. However, the District is not aware of any other studies that have confirmed these estimates. This part time occupancy is reflected in the ***General Plan***, showing a total of 19,901 dwelling units at buildout with a corresponding population of only 28,300 for a density of 1.42 persons per dwelling unit.

It should be noted that the District's water system service area extends outside the Town of Truckee limits encompassing small adjoining areas of unincorporated Nevada and Placer Counties. There are also small developed areas within the Town of Truckee that utilize private wells and are not supplied water by the District. However, for the purposes of this study, it is assumed that the Town of Truckee's population as determined by the California Department of Finance is equal to the population of the District's water service area.

Table 2-1. Historic Population Data

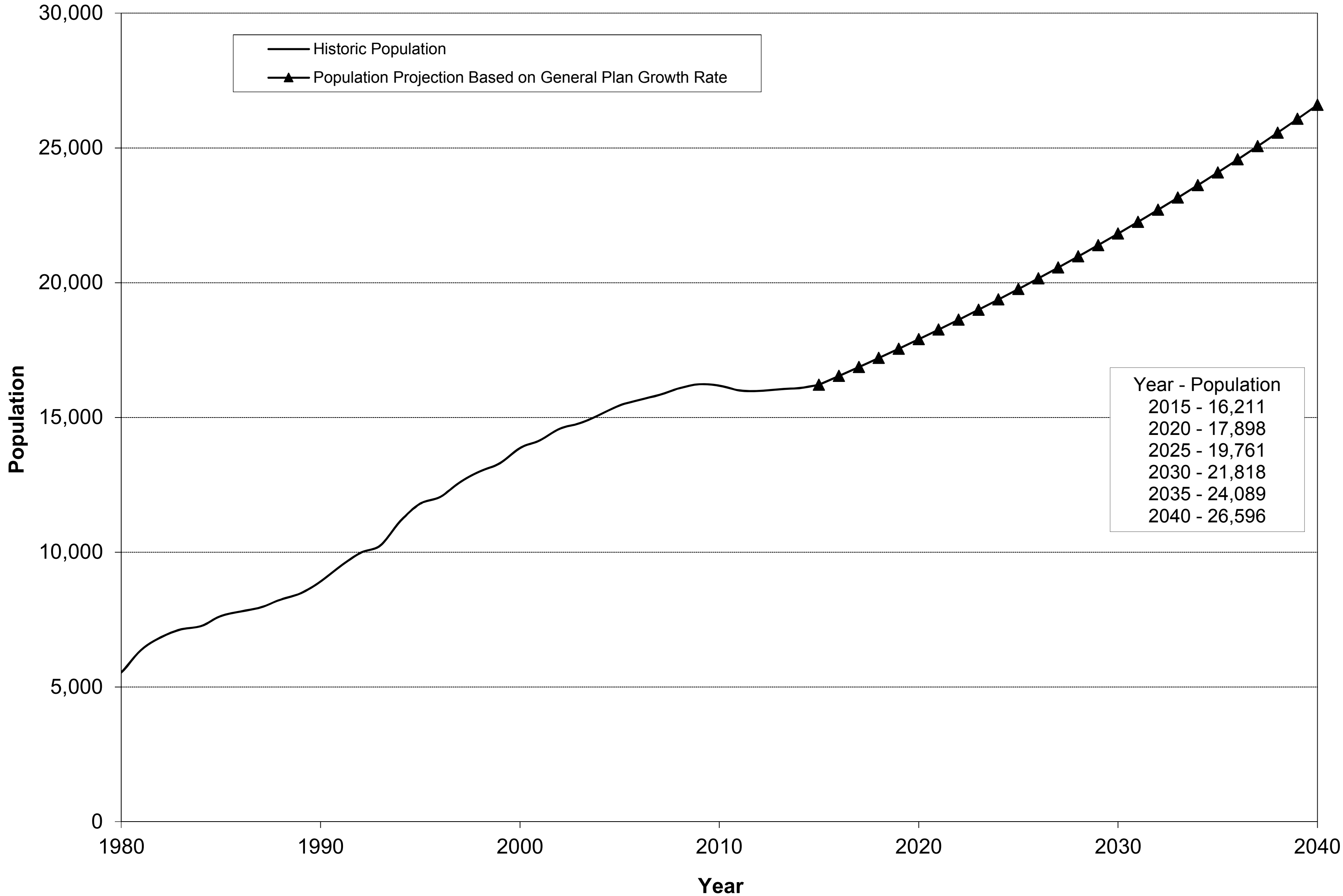
Year	Truckee Area Population	Data Source
1980	5,539	1995 Water System Master Plan
1981	6,371	1995 Water System Master Plan
1982	6,844	1995 Water System Master Plan
1983	7,136	1995 Water System Master Plan
1984	7,254	1995 Water System Master Plan
1985	7,631	1995 Water System Master Plan
1986	7,800	1995 Water System Master Plan
1987	7,950	1995 Water System Master Plan
1988	8,240	1995 Water System Master Plan
1989	8,471	1995 Water System Master Plan
1990	8,912	Town of Truckee General Plan, 1996
1991	9,482	1995 Water System Master Plan
1992	9,975	1995 Water System Master Plan
1993	10,250	1995 Water System Master Plan
1994	11,150	California Department of Finance [a]
1995	11,800	California Department of Finance [a]
1996	12,050	California Department of Finance [a]
1997	12,600	California Department of Finance [a]
1998	13,000	California Department of Finance [a]
1999	13,300	California Department of Finance [a]
2000	13,864	US Census Bureau, Census 2000
2001	14,148	California Department of Finance [b]
2002	14,583	California Department of Finance [b]
2003	14,784	California Department of Finance [b]
2004	15,098	California Department of Finance [b]
2005	15,448	California Department of Finance [b]
2006	15,651	California Department of Finance [b]
2007	15,837	California Department of Finance [b]
2008	16,085	California Department of Finance [b]
2009	16,230	California Department of Finance [b]
2010	16,180	US Census Bureau, Census 2010
2011	16,002	California Department of Finance [c]
2012	15,981	California Department of Finance [c]
2013	16,046	California Department of Finance [c]
2014	16,087	California Department of Finance [c]
2015	16,211	California Department of Finance [c]

[a] State of California, Department of Finance, *Revised Historical City, County and State Population Estimates, 1991-2000, with 1990 and 2000 Census Counts.* Sacramento, California. March 2002.

[b] State of California, Department of Finance, E-4 Population Estimates for Cities, Counties and the State, 2001–2010, with 2000 Benchmark. Sacramento, California, May 2010.

[c] State of California, Department of Finance, E-4 Population Estimates for Cities, Counties and the State, 2011–2015, with 2015 Benchmark. Sacramento, California, May 2015.

Figure 2-3. Historic and Projected Population, 1980-2040



SECTION 3

EXISTING WATER FACILITIES

SECTION 3
EXISTING WATER FACILITIES

The District's water system is reasonably complicated with 46 pressure zones, 25 pumping stations, 15 active wells and 32 active storage tanks. All demands in the Truckee systems are currently served by groundwater wells, although natural springs and surface water have been used as a water supply in the past.

PRESSURE ZONES

There are currently 46 pressure zones in the service area, with service elevations ranging from 5745 feet in the Martis Valley to 7370 feet at the highest point in Tahoe Donner. Static service pressures ranges from a high of about 200 psi to a low of about 20 psi. Approximate minimum and maximum ground elevations and static service pressures in the pressure zones are given in **Table 3-1**.

GROUNDWATER WELLS

The District currently has 12 active wells that are used to supply potable water to customers. The total production capacity of the active potable water wells is about 9,920 gpm (14.3 mgd). The wells are located at various locations throughout the distribution system. The locations of the wells are shown in **Figure 3-1** and selected well characteristics are shown in **Table 3-2**.

Three additional wells are used to serve non-potable water demands. The Donner Creek Well is connected to a separate piping system that is used to provide irrigation water to the Coyote Moon Golf Course. The Fibreboard Well is connected to a separate piping system that is used to provide irrigation water to the Gray's Crossing and Old Greenwood golf courses. The Southside No. 1 well is used to supply construction water for contractor use during the Summer construction season.

There are three other wells that are not currently used by the District. They are the B, Biltz, and Bingham Place wells. All three of these wells are low in capacity and the District does not intend to use these wells in the future. However, they have not been abandoned in accordance with California State requirements and are therefore considered inactive.

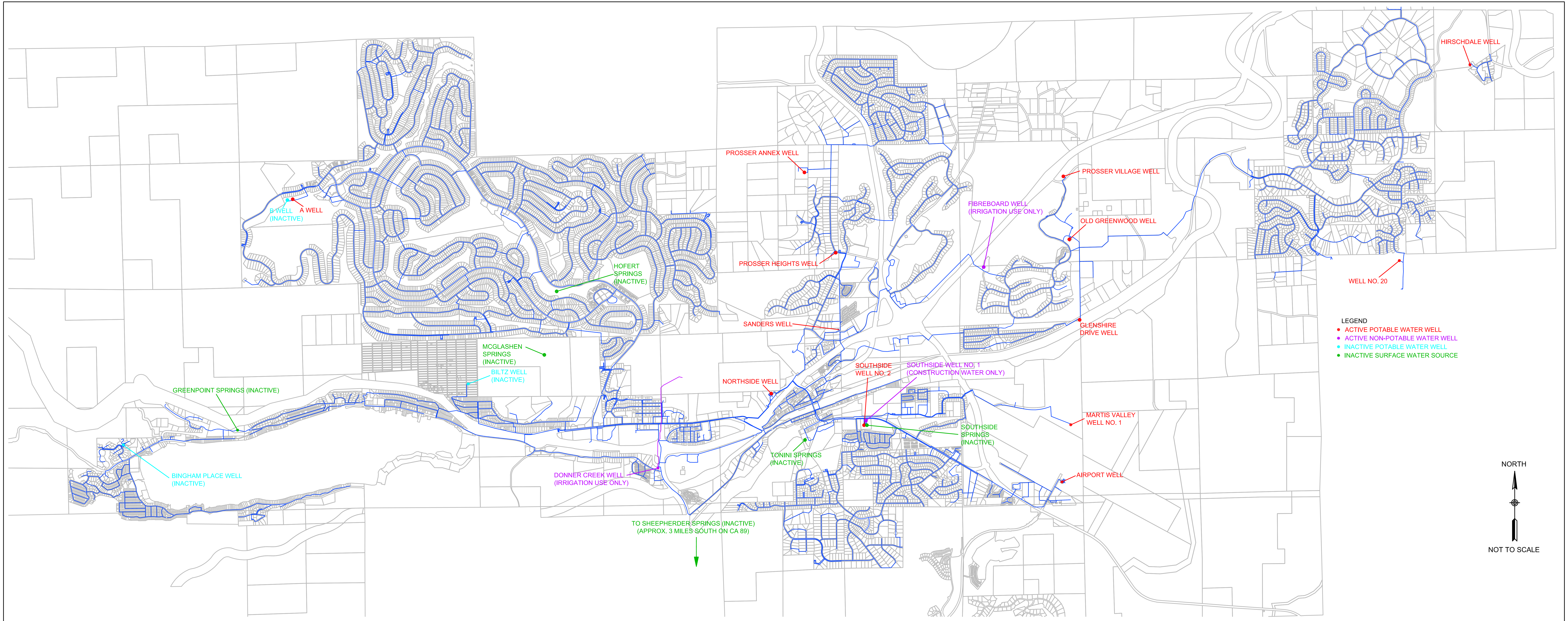
WATER TREATMENT FACILITIES

All of the District's active potable water wells are equipped with disinfection systems utilizing liquid chlorine. There is an additional treatment system at the Northside well to remove excess levels of arsenic. Water supplied to the District's customers complies with the appropriate federal and State standards.

Table 3-1. Summary of Pressure Zone Data

Pressure Zone	Target HGL, feet	Lowest Service Elevation, feet	Highest Static Service Pressure, psi	Highest Service Elevation, feet	Lowest Static Service Pressure, psi
6040	6040	5838	87	5927	49
6170	6170	5880	125	6050	52
Alder Creek	6610	6300	134	6440	74
Armstrong	6334	5959	162	6200	58
Bennett Flat	6352	6196	68	6225	55
Coldstream 6080	6080	5920	69	5930	65
DL-6124	6124	5940	80	6050	32
DL-6323	6323	5950	161	6245	34
DL-Northeast	6085	5940	63	5975	48
DL-Red Mountain	6200	6100	43	6110	39
DL-Wolfe	6220	6035	80	6140	35
Donner Trails	6160	5932	99	6005	67
Donner View	6894	6612	122	6806	38
Donner View Hydro	6990	6820	74	6890	43
Gateway	6040	5825	93	5990	22
Glacier	7500	7210	126	7370	56
Glenshire 1	6341	5880	200	6203	60
Glenshire 2	6163	5823	147	6038	54
Heidi Way	6815	6595	95	6645	74
Heights Hydro	6415	6183	100	6325	40
Hillside	6660	6357	131	6526	58
Icknield	6058	5840	94	5850	90
Innsbruck	6493	6157	145	6455	16
Lower Lakeview	6130	5820	134	6040	40
Lower Ski Run	7088	6850	103	6954	58
Lower Skislope	7015	6752	114	6830	80
Martiswoods	6360	6210	65	6255	45
Middle Skislope	7172	6800	161	7010	70
Palisades Hydro	6390	6180	91	6220	74
Pinnacle	6843	6588	110	6756	38
Pinnacle Hydro	6950	6752	86	6820	56
Ponderosa Palisades	6298	6025	118	6220	34
Prosser Heights	6338	6000	146	6180	68
Riverview	6020	5790	100	5875	63
Roundhill Hydro	6790	6618	74	6660	56
Sierra Meadows	6146	5880	115	6030	50
Sitzmark Hydro	6580	6435	63	6440	61
Soma Sierra	6286	6000	124	6200	37
Stockholm	6708	6395	135	6641	29
Town	6024	5745	121	5950	32
Trout Creek 6550	6550	6375	76	6420	56
Upper Lakeview	6230	5975	110	6100	56
Upper Ski Run	7193	No Customers	NA	No Customers	NA
Upper Skislope	7366	7010	154	7274	40
Waterloo	6071	5825	106	5876	84
West Palisades Hydro	6250	6100	65	6210	17

HGL = Hydraulic Grade Line



TRUCKEE DONNER Public Utility District

Figure 3-1
Location of Water Production Facilities

Table 3-2. Summary of Data for Potable Wells

Name	Current Capacity, gpm
A Well	135
Airport	2,585
Glenshire Drive	1,480
Martis Valley Well No. 1	1,525
Northside	520
Old Greenwood	915
Prosser Annex	500
Prosser Heights	410
Prosser Village	800
Sanders	290
Southside No. 2	220
Well No. 20	540
Total	9,920

Note: Current capacity given is based on most recent data

OTHER WATER SUPPLY SOURCES

In the past, the District has used natural springs as water supply sources and has also withdrawn water from Donner Lake. There are four springs: Greenpoint; McGlashen; Southside; and Tonini; at which the District has facilities. These springs are not currently used due to their low capacity and the need to treat the water supply in accordance with the Surface Water Treatment Rule. In addition, the District owns water rights to the Sheepherder Springs and Hofert Springs, although no facilities exist to utilize these supplies. **Figure 3-1** shows the locations of these springs. The District has abandoned the Intake Pump Station that was used to withdraw water from Donner Lake.

PUMPING STATIONS

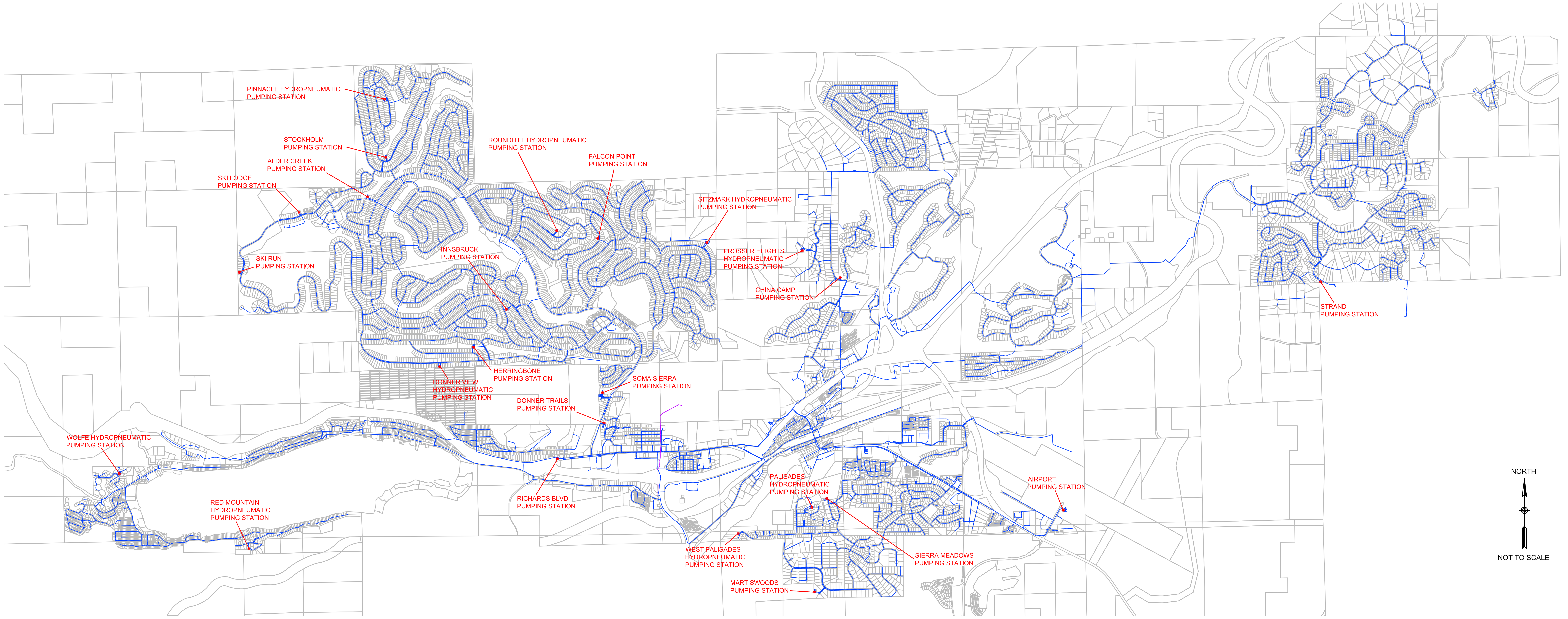
The Truckee System currently has 24 pumping stations located throughout the distribution system. These pumping stations move water from lower pressure zones to higher pressure zones to serve demands in higher elevations of the service area.

The different pumping stations have a variety of configurations, with some facilities taking suction directly from distribution system pipelines, while others are located at reservoir sites and use the reservoir as a forebay. Similarly, there is a variety of vertical turbine, end suction and horizontal split case pumps. All of the pumps are driven by electric motors. Some of the pumping stations are equipped with diesel powered generators as a backup power supply.

The locations of the pumping stations are shown in **Figure 3-2**, and selected pump characteristics are shown in **Table 3-3**.

STORAGE TANKS

The Truckee System has 35 storage tanks – 32 active and 3 inactive. Most of the tanks provide gravity pressure to a portion of the distribution system. Some also function as a forebay for a pumping station. The total storage capacity of the active water tanks is about 9.4 mg. Storage tank locations are shown in **Figure 3-3** and their characteristics are given in **Table 3-4**.



TRUCKEE DONNER Public Utility District

Figure 3-2
Location of Pumping Stations

Table 3-3. Summary of Pumping Station Data

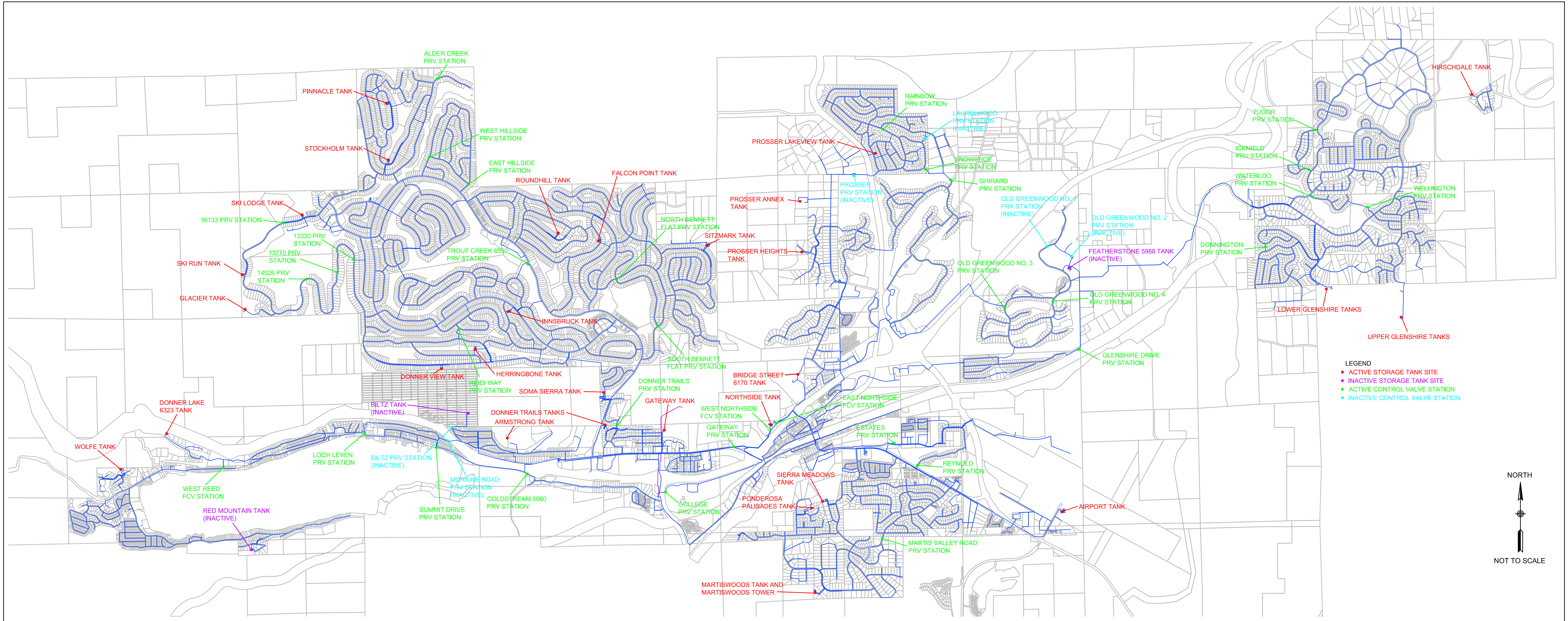
Name	Suction Pressure Zone	Discharge Pressure Zone	Number of Pumps	Total Power, hp
Airport	---	6170	4	400
Alder Creek	Stockholm	Donner View	2	60
China Camp	6170	Prosser Heights	3	90
Donner Trails	Gateway	Soma Sierra	4	600
Donner View Hydro	Donner View	Donner View Hydro	2	30
Falcon Point	Innsbruck	Stockholm	3	225
Herringbone	Stockholm	Donner View	3	150
Innsbruck	Innsbruck	Stockholm	4	200
Martiswoods	Ponderosa Palisades	Martiswoods	2	15
Pinnacle Hydro	Pinnacle	Pinnacle Hydro	2	27.5
Palisades Hydro	Ponderosa Palisades	Palisades Hydro	3	60
Prosser Heights Hydro	Prosser Heights	Prosser Heights Hydro	2	70
Red Mountain Hydro	DL-6124	Red Mountain	2	30
Richards Boulevard	Gateway	Armstrong/DL-6323	3	300
Roundhill Hydro	Stockholm	Roundhill Hydro	2	30
Sierra Meadows	6170/Sierra Meadows	Ponderosa Palisades	3	90
Sitzmark Hydro	Innsbruck	Sitzmark Hydro	2	30
Ski Lodge	Donner View	Upper Ski Run	2	80
Ski Run	Upper Ski Run	Upper Glacier	2	50
Soma Sierra	Soma Sierra	Innsbruck	4	600
Stockholm	Stockholm	Pinnacle	3	150
Strand	6170/Glenshire 2	Glenshire 1	3	120
West Palisades Hydro	Ponderosa Palisades	West Palisades Hydro	1	3
Wolfe Hydro	DL-6124	Wolfe	2	45

CONTROL VALVE STATIONS

There are 40 control valve stations located throughout the Truckee System – 34 active and 6 inactive. These stations provide service to small pressure zones, allow a means to relieve pressure in zones not directly served by a reservoir and provide additional water for fire flow demands. The locations of the stations are shown on **Figure 3-3** and selected data on the stations is given in **Table 3-5**.

PIPELINES

The existing distribution system consists of about 216 miles of pipeline ranging from 2-inches to 24-inches in diameter. The majority of the pipelines are between 4-inches and 8-inches in diameter. The oldest piping in the system dates to the 1940s, with the great majority of the system having been installed since 1960. There are a number of different pipeline materials throughout the system. The majority of the distribution pipelines are steel, with large portions of ductile iron pipe as well.



TRUCKEE DONNER
Public Utility District

Figure 3-3
Location of Storage Tanks and Control Valve Stations

Table 3-4. Summary of Storage Tank Data

Storage Tank	Volume, mg	Diameter, feet	Floor Elevation	Shell Height, feet	Overflow Elevation	Year Built
Airport	0.60	70	5886	20	5906	1979
Armstrong	0.10	27	6310	24	6334	1979
Biltz	0.085	25	6350	24	6374	1985
Bridge Street 6170	1.50	90	6139	32	6171	2002
Donner Trails 1	0.15	36	6022	20	6042	1973
Donner Trails 2	0.15	36	6022	20	6042	1990
Donner Lake 6323	0.30	40	6291	32	6323	2005
Donner View	0.35	40	6861	32	6893	1973
Falcon Point	0.20	39	6469	24	6493	1974
Featherstone 5988	0.36	44	5956	32	5988	2002
Gateway	0.45	60	6021	24	6045	1995
Glacier	0.15	36	7476	24	7500	1972
Herringbone	0.30	40	6676	32	6708	1973
Innsbruck	0.20	39	6469	24	6493	1972
Lower Glenshire 1	0.42	55	6139	24	6163	1993
Lower Glenshire 2	0.32	48	6139	24	6163	1972
Martiswoods	0.20	40	6276	22	6298	1982
Martiswoods Tower	0.10	20	6338	22	6360	1982
Northside	0.40	55	6003	24	6027	1974
Pinnacle	0.18	31.5	6811	32	6843	1973
Ponderosa Palisades	0.20	40	6276	22	6298	1972
Prosser Annex	0.215	40	6314	24	6338	1994
Prosser Heights	0.215	40	6314	24	6338	1963
Prosser Lakeview	0.25	40	6102	28	6130	1971
Red Mountain	0.21	39	6100	24	6124	1963
Roundhill	0.30	40	6676	32	6708	1974
Sierra Meadows	0.25	34	6110	36	6146	1971
Sitzmark	0.20	39	6469	24	6493	1973
Ski Lodge	0.35	50	6870	24	6894	1971
Ski Run	0.10	26	7163	30	7193	1972
Soma Sierra	0.20	40	6262	24	6286	1972
Stockholm	0.32	42	6676	32	6708	1972
Upper Glenshire 1	0.28	45	6315	24	6339	1991
Upper Glenshire 2	0.21	39	6315	24	6339	1989
Wolfe	0.23	42	6100	24	6124	1993
Total	10.05					

Table 3-5. Summary of Control Valve Station Data

Name	Upstream Pressure Zone	Downstream Pressure Zone	Notes
13330 Skislope	Middle Skislope	Lower Skislope	
13770 Skislope	Upper Skislope	Middle Skislope	
14526 Skislope	Glacier	Upper Skislope	
16133 Skislope	Upper Ski Run	Lower Ski Run	
Alder Creek	Stockholm	Alder Creek	
Biltz	Biltz Tank	Armstrong	Inactive
Coldstream 6080	DL-6323	Coldstream 6080	
College	6170	Gateway	
Donner Trails	Soma Sierra	Donner Trails	
Donnington	Glenshire 1	Glenshire 2	
East Hillside	Stockholm	Hillside	
East Northside	6170	Town	
Estates	6170	Riverview	
Gateway	6170	Gateway	
Ghirard	6170	Lower Lakeview	
Glenshire Drive	6170	6040	
Heidi Way	Stockholm	Innsbruck	
Icknield	Glenshire 2	Icknield	
Laurelwood	Upper Lakeview	Lower Lakeview	Inactive
Loch Leven	DL-6323	DL-Northeast	
Martis Valley Road	Ponderosa Palisades	Sierra Meadows	
Moraine Road	Armstrong	DL-Northeast	Inactive
North Bennett Flat	Innsbruck	Bennett Flat	
Old Greenwood No. 1	6170	6040	Inactive
Old Greenwood No. 2	6170	6040	Inactive
Old Greenwood No. 3	6170	6040	
Old Greenwood No. 4	6170	6040	
Prosser	Prosser Heights	Upper Lakeview	Inactive
Rainbow	Upper Lakeview	Lower Lakeview	
Reynold	6170	Riverview	
Snowshoe	Upper Lakeview	Lower Lakeview	
South Bennett Flat	Innsbruck	Bennett Flat	
Summit Drive	DL-6323	DL-Northeast	
Trout Creek 6550	Stockholm	Trout Creek 6550	
Tudor	Glenshire 2	Icknield	
Waterloo	Glenshire 2	Waterloo	
Wellington	Glenshire 2	Waterloo	
West Hillside	Stockholm	Hillside	
West Northside	6170	Gateway	
West Reed	DL-6323	DL-6124	

SECTION 4

SYSTEM WATER USE

SECTION 4
SYSTEM WATER USE

This section describes the historic and future water demands for the Truckee System.

HISTORIC POTABLE WATER DEMANDS

Potable water demand in the Truckee System reached a historic peak in 2007 with an average day demand of 6.67 mgd and a maximum day demand of 14.84 mgd. Since 2007, there has been a 51 percent reduction in potable water usage with an average day demand of 3.26 mgd and a maximum day demand of 7.72 mgd for the year 2015. **Figure 4-1** shows the historical trend of water demand for the Truckee System and **Table 4-1** gives this information in tabular form.

There are four main factors that contribute to the reduction in potable water demand since 2007.

1) Beginning in 2007, the District markedly expanded its pipeline replacement program in an effort to reduce the volume of water being lost due to leakage from District-owned pipes. The District has been able to replace about 67,250 feet of pipeline since that time.

2) The Fibreboard Well was placed into service in the Fall of 2009. This well supplies non-potable irrigation water to two golf courses that were previously supplied from the District's potable water system. This non-potable well has offset average day potable water production by about 0.4 mgd and maximum day potable water production by about 1.3 mgd.

3) In 2010, the District implemented volume-based billing in order to comply with California AB 2572. Prior to 2010, the District did not read meters that were installed on its residential customers and billed residential customers a flat unmetered rate for service. The District also installed an automated meter reading (AMR) system. With this AMR system, the District discovered that about 10 percent of its customer base had a leak on the customer-owned piping. A few of these leaks were as large as 10 gallons per minute. Some of these customer-side leaks had been occurring for a significant period of time prior to the installation of the meter, however the District had no method to detect the leak and then inform the customer. With the AMR system, the District has developed procedures for informing customers of leaks in a timely manner in order to reduce the amount of water lost to leakage and to minimize any property damage that may be caused by these customer-side leaks.

4) Water production in 2014 and 2015 was significantly lower due to mandates issued by the State of California. For 2015, the District was assigned a water conservation target of 28 percent.

EXISTING WATER DEMANDS

Potable water production for the year 2015 averaged 3.26 million gallons per day (mgd) with a peak of 7.72 mgd that occurred on June 20, 2015. Total potable water production was about 1,191 million gallons. An additional 193 million gallons of raw water was produced to serve golf course irrigation demands. **Table 4-2** gives a breakdown of this demand by customer category.

Figure 4-1. Historic Potable Water Demands, 1970 - 2015

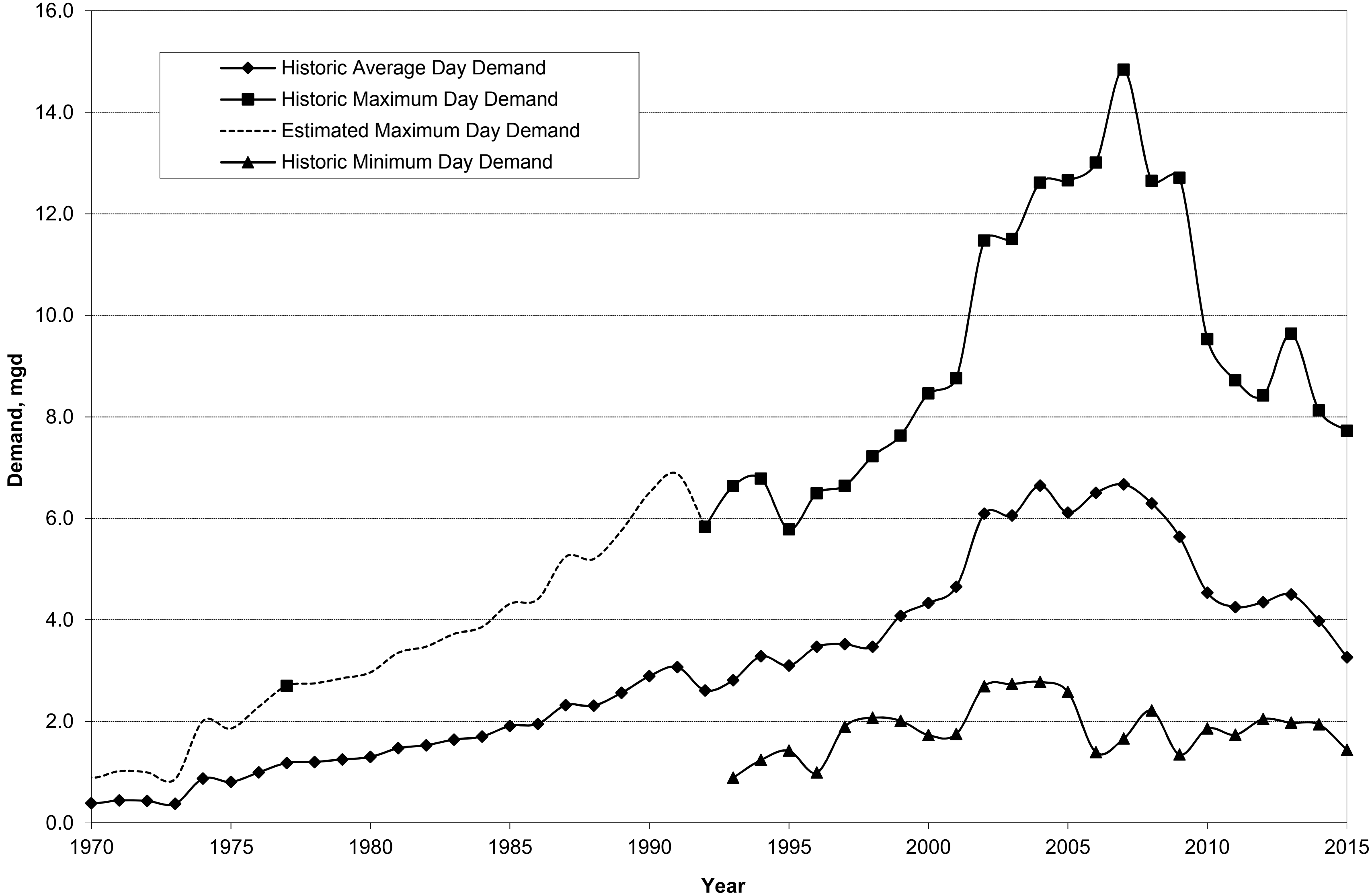


Table 4-1. Historic Potable Water Production

Year	Average Day mgd	Average Day gpm	Maximum Day mgd	Maximum Day gpm	Peaking Factor
1980	1.30	901	NA	NA	NA
1981	1.47	1,021	NA	NA	NA
1982	1.53	1,060	NA	NA	NA
1983	1.64	1,138	NA	NA	NA
1984	1.70	1,182	NA	NA	NA
1985	1.91	1,328	NA	NA	NA
1986	1.95	1,353	NA	NA	NA
1987	2.32	1,611	NA	NA	NA
1988	2.31	1,606	NA	NA	NA
1989	2.56	1,775	NA	NA	NA
1990	2.89	2,005	NA	NA	NA
1991	3.07	2,131	NA	NA	NA
1992	2.61	1,810	NA	NA	NA
1993	2.81	1,954	NA	NA	NA
1994	3.28	2,277	6.78	4,708	2.07
1995	3.10	2,150	5.78	4,016	1.86
1996	3.47	2,407	6.49	4,505	1.87
1997	3.52	2,445	6.64	4,611	1.89
1998	3.47	2,413	7.22	5,014	2.08
1999	4.08	2,833	7.63	5,299	1.87
2000	4.33	3,004	8.46	5,877	1.96
2001	4.65	3,228	8.76	6,085	1.88
2002	6.09[a]	4,229	11.47[a]	7.965	1.88
2003	6.05	4,204	11.50	7,986	1.90
2004	6.64	4,614	12.61	8,759	1.90
2005	6.11	4,244	12.66	8,790	2.07
2006	6.50	4,514	13.01	9,034	2.00
2007	6.67	4,631	14.84	10,304	2.23
2008	6.29	4,371	12.65	8,783	2.01
2009	5.63	3,913	12.71	8,826	2.26
2010	4.53	3,149	9.53	6,616	2.10
2011	4.25	2,952	8.72	6,055	2.05
2012	4.35	3,019	8.42	5,847	1.94
2013	4.50	3,124	9.64	6,692	2.14
2014	3.98	2,761	8.13	5,643	2.04
2015	3.26	2,266	7.72	5,362	2.37

[a] Large increase in production for 2002 results from acquisition of Donner Lake and Glenshire Water Systems

Table 4-2. Demands for Potable Water and Raw Water – Actual - 2015

Use Type	Additional Description	Level of Treatment	Volume (million gals)
Single-Family		Drinking Water	602
Multi-Family		Drinking Water	69
Commercial		Drinking Water	91
Industrial		Drinking Water	0
Institutional/Governmental		Drinking Water	40
Landscape		Drinking Water	44
Saline Water Intrusion Barrier		Drinking Water	0
Agricultural Irrigation		Drinking Water	0
Wetlands or Wildlife Habitat		Drinking Water	0
Sales/Transfers to Other Agencies		Drinking Water	0
Losses		Drinking Water	345
Other	Irrigation	Raw Water	193
Total			1,384

FUTURE WATER DEMANDS

Water demand projections for buildout conditions have been calculated based upon anticipated development of all currently vacant parcels. Currently developed parcels were assumed to continue into the future with no change in land use. A projected buildout demand was then calculated for each vacant parcel based on the anticipated land use and the size of the parcel. This analysis resulted in a buildout average day potable water demand of 8.66 mgd and a buildout maximum day potable water demand of 17.07 mgd. Detailed information regarding these buildout projections is given in the report entitled ***Buildout Water Demand Projections***, September 2015. These buildout water demand projections assumed that the percentage of non-revenue water remained unchanged in the future.

It is expected that the State of California will prioritize reducing the level of non-revenue water (NRW) experienced by urban water suppliers. The District recognizes the need to reduce its NRW and has increased its efforts in the areas of water main replacement, leak detection surveys, leak repairs and water system metering over the past few years. The District plans to continue these increased efforts in the foreseeable future.

Based upon these increased efforts, a revised buildout average day potable water demand of 7.49 mgd was calculated. **Table 4-3** gives the projected breakdown of future water demand by category in 5-year increments.

Table 4-3. Demands for Potable Water and Raw Water – Projected

		Volume (million gals)			
Use Type	Additional Description	2020	2025	2030	2035
Single-Family	Drinking Water	709	816	924	1,030
Multi-Family	Drinking Water	141	200	259	318
Commercial	Drinking Water	143	181	219	257
Industrial	Drinking Water	1	1	2	2
Institutional/Governmental	Drinking Water	106	157	209	261
Landscape	Drinking Water	83	92	102	112
Saline Water Intrusion Barrier	Drinking Water	0	0	0	0
Agricultural Irrigation	Drinking Water	0	0	0	0
Wetlands or Wildlife Habitat	Drinking Water	0	0	0	0
Sales/Transfers	Drinking Water	0	0	0	0
Losses	Drinking Water	345	335	305	261
Other	Raw Water	240	240	240	240
Total		1,768	2,022	2,260	2,481

CURRENT AND POTENTIAL USE OF RECYCLED WATER

In November 1990, the Truckee-Carson-Pyramid Lake Water Rights Settlement Act, Title II of Public Law 101-618 [104 Stat. 3289, 3294] was signed into law by the US Government. Section 204.c.1.G of that Act essentially prohibits the reduction in return flow of treated wastewater to the Truckee River and thereby precludes use of recycled water in the Truckee area. The text of the Section is given below:

G) if the Tahoe-Truckee Sanitation Agency or its successor (hereafter 'TTSA') changes in whole or in part the place of disposal of its treated wastewater to a place outside the area between Martis Creek and the Truckee River below elevation 5800 NGVD Datum, or changes the existing method of disposing of its wastewater, which change in place or method of disposal reduces the amount or substantially changes the timing of return flows to the Truckee River of the treated wastewater, TTSA shall:

(i) acquire or arrange for the acquisition of preexisting water rights to divert and use water of the Truckee River or its tributaries in California or Nevada and discontinue the diversion and use of water at the preexisting point of diversion and place of use under such rights in a manner legally sufficient to offset such reduction in the amount of return flow or change in timing, and California's Truckee River basin gross diversion allocation shall continue to be charged the amount of the discontinued diversion; or

(ii) in compliance with California law, extract and discharge into the Truckee River or its tributaries an amount of Truckee River basin groundwater in California sufficient to offset such reduction or change in timing, subject to the following conditions:

(a) extraction and discharge of Truckee River Basin groundwater for purposes of this paragraph shall comply with the terms and conditions of subparagraphs 204(c)(1) (B) and (D) and shall not be deemed use of Truckee River basin groundwater within the State of Nevada within the meaning of subparagraph 204(c)(1)(D); and

(b) California's Truckee River basin gross diversion allocation shall be charged immediately with the amount of groundwater discharged and, when California's Truckee River Basin gross diversion allocation equals 22,000 acre-feet or when the total of any reductions resulting from the changes in the place or method of disposal exceed 1000 acre-feet, whichever occurs first, the California Truckee River basin gross diversion allocation shall thereafter be charged with an additional amount of water required to compensate for the return flows which would otherwise have accrued to the Truckee River basin from municipal and industrial use of the discharged groundwater. In no event shall the total of California's Truckee River gross diversions and extractions exceed 32,000 acre-feet.

(iii) For purposes of this paragraph, the existing method of disposal shall include, in addition to underground leach field disposal, surface spray or sprinkler infiltration of treated wastewater on the site between Martis Creek and the Truckee River referred to in this subsection.

(iv) The provisions of this paragraph requiring the acquisition of water rights or the extraction and discharge of groundwater to offset reductions in the amount or timing of return flow to the Truckee River shall also apply to entities other than TTSA that may treat and dispose of wastewater within the California portion of the Truckee River basin, but only if and to the extent that the treated wastewater is not returned to the Truckee River or its tributaries, as to timing and amount, substantially as if the wastewater had been treated and disposed of by TTSA in its existing place of disposal and by its existing method of disposal. The provisions of this paragraph shall not apply to entities treating and disposing of the wastewater from less than eight dwelling units.

WATER DEMAND FOR LOW-INCOME HOUSING

The current Town of Truckee Housing Element was adopted in January of 2015. According to that document, there is a need for 1,270 low-income housing units. Based upon the 325 gallons per connection per day described in the ***Buildout Water Demand Projections*** report, there is a need for about 0.41 million gallons per year to serve these housing units. This demand is included in the existing and future water demands described earlier in this section.

SECTION 5

SBX7-7 BASELINES AND TARGETS

SECTION 5
SB X7-7 BASELINES AND TARGETS

The Water Conservation Act of 2009, also known as the SB X7-7, set a goal of reducing statewide urban water use by 20 percent by the year 2020. Each retail urban water supplier is required to determine water use during its baseline period and target water use for the years 2015 and 2020 in order to help the State achieve the 20 percent reduction.

BASELINE WATER USAGE CALCULATION

SB X7-7 requires calculation of per capita water usage for a continuous 10-year period ending no earlier than December 31, 2004 and no later than December 31, 2010.

As discussed in Section 2, the District acquired the Donner Lake Water System in May 2001 and the Glenshire Water System in February 2002. The District does not have accurate records regarding production and water usage in the Donner Lake area for early 2001 and prior years. Additionally, the District does not have accurate historical data regarding population in different parts of Truckee for 2001.

Therefore, the nine-year period of 2002 to 2010 is utilized for the baseline calculation. The District has accurate data for this time period and the water system service area during this time more closely matches the Town of Truckee limits and its corresponding population estimates. The baseline water usage is 407 gallons per capita per day (gpcd) as documented in **Table 5-1**.

It should be noted that the baseline water usage value is significantly higher than the 243 gpcd baseline established by the Department of Water Resources for the North Lahontan region. One main reason for this difference is that the calculation methodology does not adjust for the part-time population in the Truckee area. It only considers the permanent population. As noted in Section 2, the Town of Truckee has estimated that about half of the housing stock in the Truckee area is occupied on a part time basis. This part-time population can easily lead to a doubling of the number of people served at any given time, along with a significant increase in water demand. Additionally, there are numerous part-time occupancy properties that are equipped with timer-controlled irrigation systems. These properties exert an irrigation demand even though there is no corresponding population.

DEMAND REDUCTION TARGET CALCULATION

SB X7-7 requires that a water supplier develop a year 2020 water use target and a year 2015 interim target using one of four methods. These targets are intended to meet the goal of reducing statewide per capita water consumption by 20 percent by the year 2020, as established by the California Legislature.

As defined in SB X7-7, there are four allowable methods for determining the 2020 target. The District has selected Method 1, which is “Eighty percent of the water supplier’s baseline per capita water use.” Therefore, the District’s water demand targets are:

2015: 407 x 90% = 367 gpcd

2020: 407 x 80% = 326 gpcd

Table 5-1. Calculation of Baseline Per Capita Water Usage

Baseline Year		Service Area Population	Gross Water Use (millions of gallons)	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	2002	14,583	2,307	433
Year 2	2003	14,784	2,272	421
Year 3	2004	15,098	2,505	455
Year 4	2005	15,448	2,271	403
Year 5	2006	15,651	2,457	430
Year 6	2007	15,837	2,526	437
Year 7	2008	16,085	2,396	408
Year 8	2009	16,230	2,163	365
Year 9	2010	16,180	1,852	314
10-15 Year Average Baseline GPCD				407
5 Year Baseline GPCD				
Baseline Year		Service Area Population	Gross Water Use (millions of gallons)	Daily Per Capita Water Use (GPCD)
Year 1	2006	15,651	2,457	430
Year 2	2007	15,837	2,526	437
Year 3	2008	16,085	2,396	408
Year 4	2009	16,230	2,163	365
Year 5	2010	16,180	1,852	314
5 Year Average Baseline GPCD				391
2015 Compliance Year GPCD				
2015		16,211	1,384	234

SB X7-7 also requires the determination of a minimum water use reduction. This calculation is documented in **Table 5-2**.

Table 5-2. Confirmation of Minimum Reduction for 2020 Target

5 Year Baseline GPCD	Maximum 2020 Target*	Calculated 2020 Target	Confirmed 2020 Target
391	371	326	326
* Maximum 2020 Target is 95% of the 5 Year Baseline GPCD			

With the minimum water use reduction being met, demand reduction targets are calculated for the years 2015 and 2020 as shown in **Table 5-3.**

Table 5-3. Calculation of 2015 Interim Target GPCD

Confirmed 2020 Target	10-15 year Baseline GPCD	2015 Interim Target GPCD
326	407	367

METHODS TO ACHIEVE THE DEMAND REDUCTION TARGET

As shown in **Table 5-1**, per capita water usage for the year 2010 was 314 gpcd. Per capita water usage for 2015 was 234 gpcd. These values comply with the District's year 2020 target of 326 gpcd target.

Over the next few years, the District intends to complete its water meter installation program. Once the meter installation program is completed, additional funds should be available to supplement the District's pipeline replacement program. By replacing additional pipelines in poor condition, the District should be able to further reduce its system losses and water production.

The District intends to continue its current practices of monitoring and notification regarding customer-side water leaks. The District also intends to maintain its current slate of demand management measures (DMMs) that are discussed in Section 8.

SECTION 6

WATER SYSTEM SUPPLIES

SECTION 6
WATER SYSTEM SUPPLIES

This section provides a discussion of the available water supplies to meet the existing and future water demands through buildout of the District's service area.

MARTIS VALLEY GROUNDWATER BASIN

The District currently obtains its all of its water supply through the pumping of groundwater from the Martis Valley Groundwater Basin (MVGB). The MVGB is a multiple aquifer system consisting of basin-fill sedimentary units and interlayered basin-fill volcanic units. Detailed information regarding geology of the MVGB can be found in a number of sources, including:

- Availability of Ground Water. Prepared for the Truckee Donner Public Utility District by Hydro-Search Inc. Reno, Nevada. February 1975.
- Truckee and Vicinity Ground-Water Resource Evaluation. Prepared for Dart Resorts Inc. by Hydro-Search Inc. Reno, Nevada. April 1980.
- Ground-Water Management Plan, Phase 1, Martis Valley Ground-Water Basin, Basin No. 6-67, Nevada and Placer Counties. Prepared for the Truckee Donner Public Utility District by Hydro-Search Inc. Reno, Nevada. January 1995.
- Ground Water Resource Evaluation. Prepared For The Truckee Donner Public Utility District by Nimbus Engineers. Reno, Nevada. November 2000.
- Ground Water Availability In The Martis Valley Ground Water Basin, Nevada and Placer Counties, California. Prepared for the Truckee Donner Public Utility District, Placer County Water Agency and Northstar Community Services District by Nimbus Engineers. Reno, Nevada. March 2001.
- Supplemental Report to California's Groundwater – Bulletin 118, Update 2003. Prepared by the California Department of Water Resources. Sacramento, California. October 2003.
- Martis Valley Groundwater Management Plan. Prepared for the Truckee Donner Public Utility District, Placer County Water Agency and Northstar Community Services District by Brown and Caldwell and Balance Hydrologics, Reno, Nevada, April 2013.

The California Department of Water Resources has not determined that the MVGB is being overdrafted and there are not any known instances of contamination of the MVGB. The MVGB is currently unadjudicated and none of the groundwater users has expressed a desire to have the basin adjudicated.

QUANTITY OF GROUNDWATER IN THE MARTIS VALLEY BASIN

A number of studies have been conducted over the past 30 years to investigate and quantify the amount of water available in the MVGB. As knowledge regarding the geologic characteristics of the MVGB has improved over the years, the estimates of available water have been refined and therefore, the most recent studies are considered to have the best information regarding water availability.

The 1975 study by Hydro-Search estimated annual recharge to the MVGB at 18,200 acre-feet per year (AFY) with a total subsurface storage volume of 1,050,000 acre-feet. The 1975 study also concluded that 13,000 AFY was available for consumptive uses. The 1980 and 1995 studies were essentially updates of the 1975 study and provided additional information regarding the MVGB. However, a new evaluation of groundwater availability was not conducted as part of those efforts.

The 2001 study represented the first reconsideration of the MVGB water availability since the 1975 study. This 2001 study concluded that total subsurface storage volume is 484,000 acre-feet, with an annual recharge of 29,165 AFY. Additional water is recharged to the upper layer of the MVGB by the Tahoe-Truckee Sanitation Agency's (TTSA's) wastewater treatment plant. This 2001 study concluded that the sustainable yield of the MVGB is 24,000 AFY.

In 2002, a study entitled ***Independent Appraisal of Martis Valley Ground Water Availability, Nevada and Placer Counties*** was conducted by Kennedy/Jenks Consultants. This study agreed with the sustainable yield estimate of 24,000 AFY by Nimbus Engineers in 2001. The Kennedy/Jenks study also concluded that the 24,000 AFY likely underestimates the amount of water available on a sustainable basis since the 2001 Nimbus study underestimated both basin recharge and ground water discharge to tributary streams.

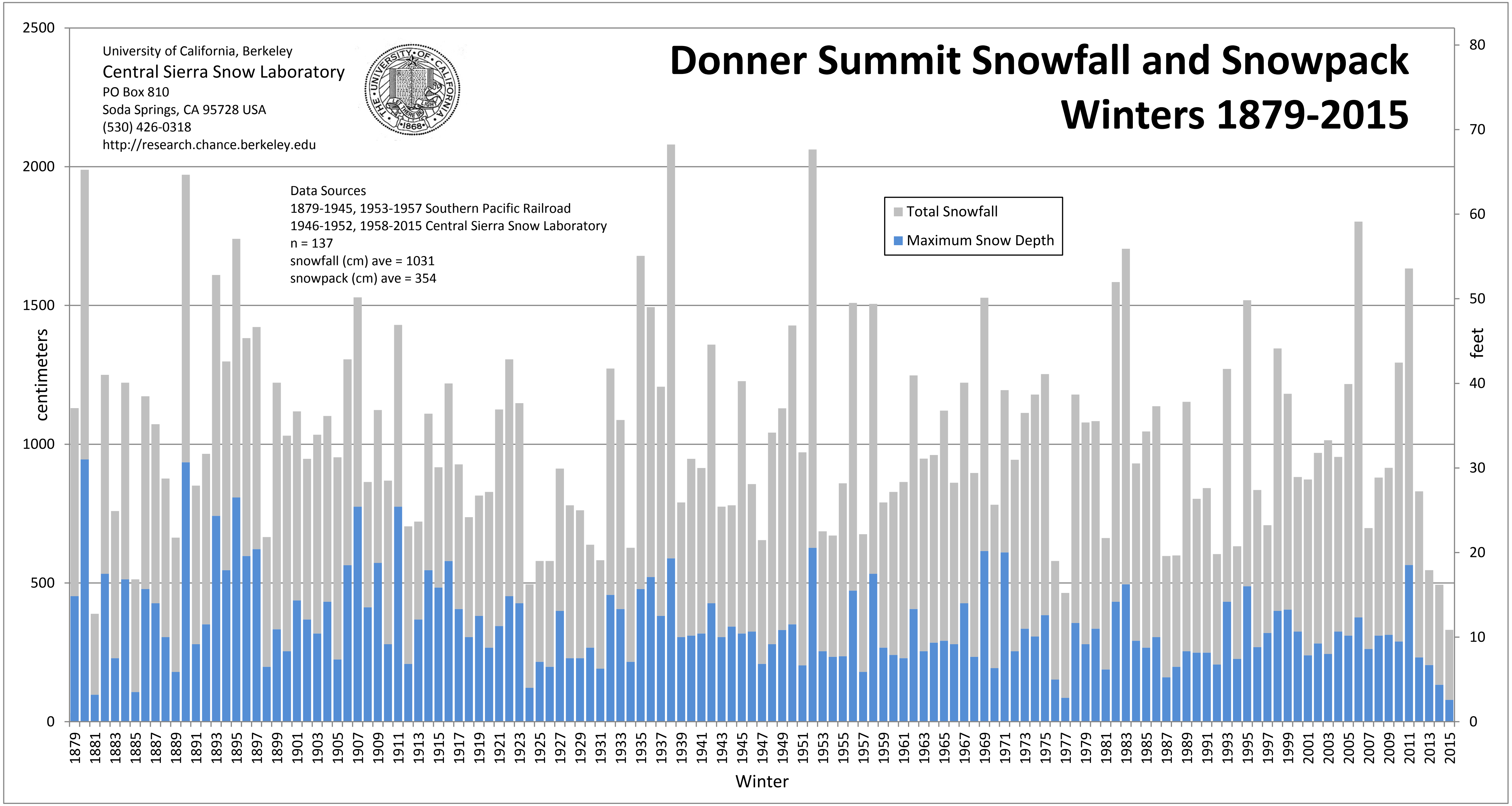
In April 2003, a study conducted by InterFlow Hydrology and Cordilleran Hydrology entitled ***Measurement of Ground Water Discharge to Streams Tributary to the Truckee River in Martis Valley, Nevada and Placer Counties, California*** examined the issue of ground water discharge to tributary streams and concluded that about 34,000 AFY of water is available on a sustainable basis.

As noted above, the MVGB is unadjudicated and will likely remain unadjudicated in the future. Therefore, it is reasonable to assume that, at a minimum, the 24,000 AFY (7,820 million gallons) of water cited in the Nimbus study is available to support development in Truckee and the surrounding areas.

RELIABILITY OF THE WATER SUPPLY

The great majority of groundwater basin recharge results from snowfall and snowmelt during the winter period. Summer thunderstorms can produce high intensity rainfall events of short duration. However, these storms do not make a significant contribution to basin recharge. **Figure 6-1** shows historic snowfall and snowpack data at Donner Summit for the period of 1879-2015 as measured by the Central Sierra Snow Laboratory. As shown in this graph snowfall (and corresponding basin recharge) can vary significantly from year to year. The driest single year occurred in 2015 with total snowfall of about 11 feet. The 3-year period with the minimum snowfall occurred in 2013-2015 with a total of about 45 feet. Considering the large amount of water in storage in relation to the projected buildout demand, one year (or even multiple years) of below average precipitation and basin recharge would not have a significant impact upon the water supply. Therefore, the 24,000 AFY (7,820 million gallons) noted above also considered the 3-year minimum water supply.

FIGURE 6-1



Donner Summit Snowfall and Snowpack
Winters 1879-2015
University of California, Berkeley
Central Sierra Snow Laboratory
PO Box 810
Soda Springs, CA 95728 USA
(530) 426-0318
http://research.chance.berkeley.edu
Data Sources
1879-1945, 1953-1957 Southern Pacific Railroad
1946-1952, 1958-2015 Central Sierra Snow Laboratory
n = 137
snowfall (cm) ave = 1031
snowpack (cm) ave = 354
Total Snowfall
Maximum Snow Depth
centimeters
feet
Winter

MANAGEMENT OF THE MARTIS VALLEY GROUNDWATER BASIN

A management plan for the Martis Valley Groundwater Basin was prepared in 2013. A copy of this groundwater management plan is included in Appendix C.

WATER SUPPLY QUALITY

As noted in the District's ***2015 Water Quality Report***, all water supplied to potable water customers is in compliance with State and Federal regulations. The District does operate a treatment system at the Northside well to remove excess levels of arsenic. The quality of the existing sources has been consistent and the District does not anticipate any future changes in the quality of its existing sources.

GROUNDWATER WITHDRAWALS

The major producers of water in the MVGB are the District, the Northstar Community Services District, five golf courses and Teichert Aggregates. There are also a number of small wells supporting individual residences along with some other uses such as the Martis Creek Campground and the TNT Materials concrete plant.

For 2015, withdrawals from the MVGB by the District totaled 1,191 million gallons for potable water purposes and an additional 193 million gallons of raw water for irrigation and construction water purposes. Historic groundwater pumping by the District is summarized in **Table 6-1**. Total groundwater withdrawals from the MVGB for 2015 are estimated at 2,411 million gallons. This data is summarized in **Table 6-2**.

Table 6-1. Groundwater Volume Pumped by the District

Groundwater Type	Location or Basin Name	2011	2012	2013	2014	2015
Alluvial Basin	Martis Valley	1,727	1,857	1,846	1,682	1,384
TOTAL (millions of gallons)		1,727	1,857	1,846	1,682	1,384

EXISTING PRODUCTION CAPACITY IN RELATION TO PROJECTED DEMANDS

The current maximum day potable water demand for the Truckee System is 7.7 mgd. It is anticipated that this maximum day demand will increase to 9.5 mgd and 10.6 mgd by the years 2020 and 2025, respectively. Average day potable water demand will increase from 3.7 mgd currently to 4.7 mgd in the year 2020 and 5.3 mgd in the year 2025. The anticipated growth in maximum day potable water demand is shown graphically in **Figure 6-2.**

The District currently operates 12 potable water wells. The total capacity of these wells is about 9,920 gpm (14.3 mgd). The overall system potable water production capacity is adequate to serve projected demands through the year 2041. However, the firm capacity of these existing facilities will be exceeded in the year 2025, since a failure of Airport Well would leave a production capacity of only 10.6 mgd.

Table 6-2. Volume Pumped from the Martis Valley Groundwater Basin in 2015

Entity	Treatment	Estimated Withdrawal (millions of gallons)	Data Source/Notes
Former PCWA Zone 4	Potable	82	Mike Staudenmayer, NCSD GM
Northstar CSD (incl. snowmaking)	Potable	355	Mike Staudenmayer, NCSD GM
TDPUD	Potable	1,191	
TDPUD – Golf Course Irrigation	Non-Potable	193	
Tahoe Donner Golf Course	Non-Potable	69	Estimated from 2013 Groundwater Management Plan
Ponderosa Golf Course	Non-Potable	5	Mike Stemen, TDRPD Maintenance
Martis Camp Golf Course	Non-Potable	81	Estimated from 2013 Groundwater Management Plan
Lahontan Golf Course	Non-Potable	81	Estimated from 2013 Groundwater Management Plan
Schaeffer's Mill Golf Course	Non-Potable	81	Estimated from 2013 Groundwater Management Plan
Individual Wells		252	Antonucci, 2001
State & Federal		21	Antonucci, 2001
Total (millions of gallons)		2,412	

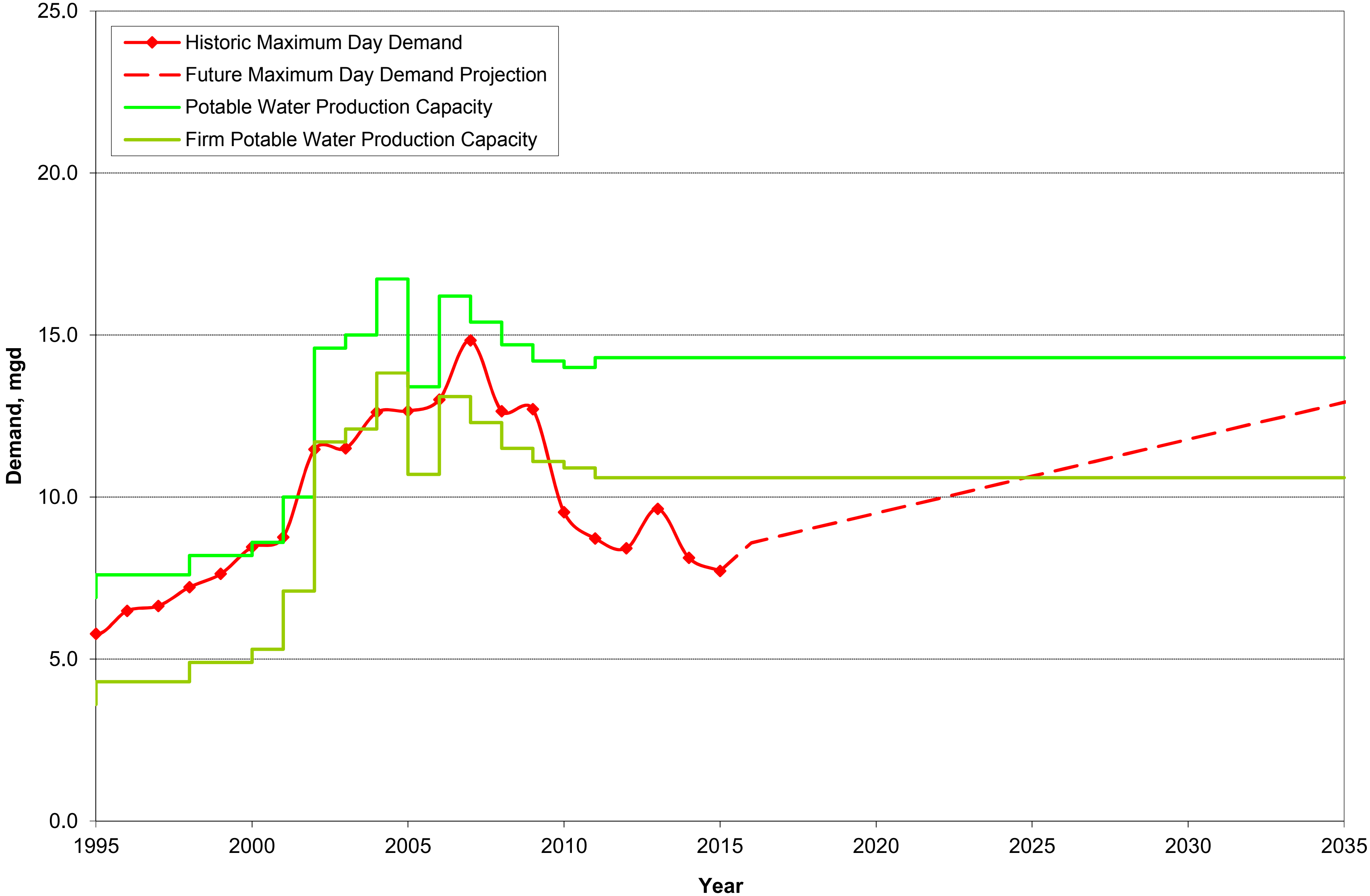
WASTEWATER AND RECYCLED WATER

The District does not provide either wastewater collection or treatment to customers within its service area. The great majority of the District's water customers are served by a centralized wastewater collection system owned by the Truckee Sanitary District (TSD). This TSD maintained system collects the wastewater and conveys it to the Tahoe-Truckee Sanitation Agency's (TTSA) regional water reclamation plant.

The remainder of the District's water customers is not served by centralized wastewater collection and treatment. Water customers in the Olympic Heights, Prosser Heights, Prosser Lakeview, Ponderosa Palisades and Martiswoods areas are served by individual septic tank and leachfield systems. TSD also provides wastewater conveyance service for portions of Placer County outside of the District's service area.

All wastewater collected by TSD is conveyed to the TTSA Water Reclamation Plant for treatment. The TTSA plant has a peak capacity of 9.6 mgd and treats wastewater from the entire Truckee/North Lake Tahoe area within the state of California. During 2015, TSD conveyed about 394 million gallons of wastewater to the treatment plant. About 80 percent of TSD's current total wastewater flow is generated within the District's water service territory. No data is available to quantify the amount of wastewater treated by individual septic tank and leachfield systems.

Figure 6-2. Projected Potable Water Demand vs. Existing Production Capacity, 1995-2035



The treatment process at the TTSA plant involves full tertiary treatment including phosphorus and nitrogen removal. Treated effluent is discharged into the uppermost layer of the groundwater aquifer using subsurface percolation. Sludge generated by the wastewater treatment process is conveyed to either Orient Farms in Gerlach, Nevada, or the Lockwood Regional Landfill for disposal. During 2015, the TTSA plant processed about 1,250 million gallons of wastewater.

FUTURE WATER SUPPLIES

Currently, the District uses groundwater as its sole source of supply. In the past, a number of local springs were utilized. Their use was discontinued due to the limited capacity and need for more extensive treatment as required by the Surface Water Treatment Rule. Construction of a surface water treatment plant to utilize surface water from Donner Lake was undertaken by a developer in the early 1970s, but was halted due to political issues and questions regarding the status of water rights.

The District does not currently use recycled water and does not anticipate using recycled water in the future as discussed in Section 4. The use of surface water, either through a treatment plant or wells with filtration, requires that a number of technical, legal and environmental issues be investigated and addressed.

There is sufficient groundwater available to meet the District's needs at buildout conditions and the District anticipates that groundwater will remain its main supply source. Importation of water from other areas, water transfers and water exchanges have not been investigated since they are unnecessary. Similarly, the use of desalinated water has not been investigated. Considering that the Truckee area is about 200 miles from the ocean, the use of desalination is considered extremely unpractical.

BUILDOUT WATER DEMANDS

As discussed in Section 4, buildout potable water demand for the Truckee System is estimated to be 2,733 million gallons per year. An additional 240 million gallons per year of non-potable water demand is also expected. When other users of the MVGB are considered, total withdrawals at buildout conditions are estimated to be 4,217 million gallons as noted in **Table 6-3**.

With a total water supply of at least 24,000 AFY (7,820 million gallons), there is adequate water supply to meet the projected buildout conditions. There are 484,000 acre-feet (157,701 million gallons) of water in storage in the MVGB. The projected total demand of 4,217 million gallons at buildout is equal to about three percent of the capacity of the MVGB and there is adequate water to provide for over 37 years worth of demand even if no recharge of the basin were to occur.

ADDITIONAL POTABLE WATER PRODUCTION CAPACITY

The available production capacity is sufficient to meet current demands. Based upon the projected growth, the potable water production facilities will be unable to meet projected maximum day demands in the year 2041. However, the firm capacity will be exceeded in 2025. Based on the 14.3 mgd of total available capacity, an additional 2.5 mgd of production capacity is needed over the next 20 years to meet projected demands and to provide adequate firm capacity to the system.

Table 6-3. Anticipated Martis Valley Groundwater Basin Withdrawals at Buildout

Entity	Treatment	Estimated Withdrawal (millions of gallons)	Data Source/Notes
Former PCWA Zone 4	Potable	261	PCWA 2010 UWMP
Northstar CSD (incl. snowmaking)	Potable	391	Mike Staudenmayer, NCSD GM
TDPUD	Potable	2,733	
TDPUD – Golf Course Irrigation	Non-Potable	240	
Tahoe Donner Golf Course	Non-Potable	69	Estimated from 2013 Groundwater Management Plan
Ponderosa Golf Course	Non-Potable	7	
Martis Camp Golf Course	Non-Potable	81	Estimated from 2013 Groundwater Management Plan
Lahontan Golf Course	Non-Potable	81	Estimated from 2013 Groundwater Management Plan
Schaeffer's Mill Golf Course	Non-Potable	81	Estimated from 2013 Groundwater Management Plan
Individual Wells		252	Antonucci, 2001
State & Federal		21	Antonucci, 2001
Total (millions of gallons)		4,217	

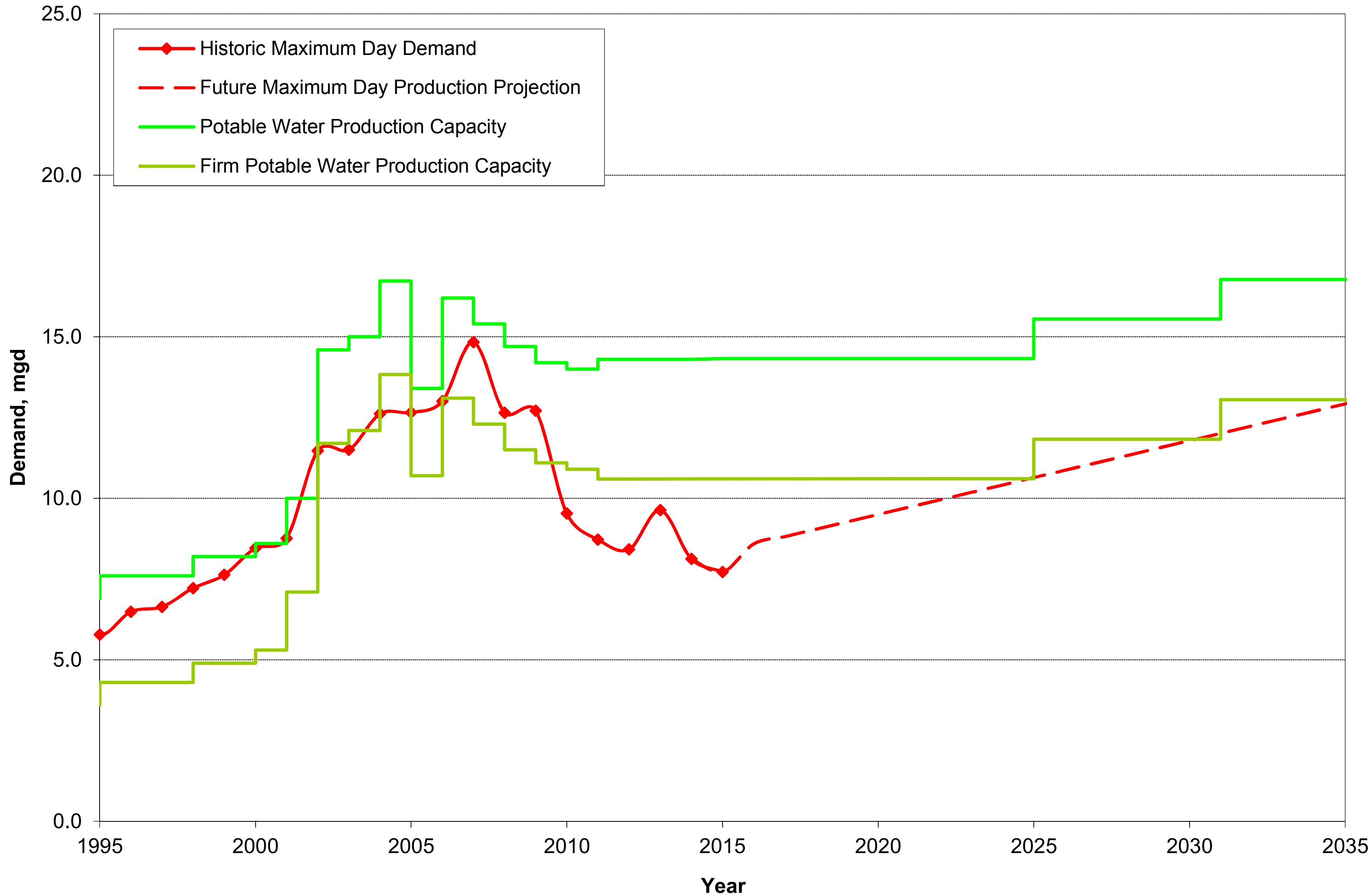
For the purposes of water supply planning, it is assumed that new wells will have a capacity of 850 gpm each. Therefore, it is expected that two new water supply wells will be needed in the period of 2025 to 2035, with two more wells required to meet buildout conditions. These wells should be constructed as growth and increases in water demand dictate. **Figure 6-3** gives the relationship of projected demand to the recommended water production improvements. If the capacity of new wells differs significantly from the assumed 850 gpm value, the recommendations given herein should be adjusted accordingly.

In 2002 and 2003, the District drilled a number of exploration wells in order to identify locations for future groundwater wells. As a result of this exploration well program, the District acquired four well sites. The Prosser Village Well was constructed in 2004 and the Old Greenwood Well was constructed in 2006 at two of these sites.

The Fibreboard Well was constructed in 2009 at the third site. The water produced by this well exceeds the MCL for arsenic and is considered non-potable water. However, this water is perfectly suited for irrigation purposes and supplies water to the Gray's Crossing and Old Greenwood golf courses. This well allowed for the removal of about 1.3 mgd of maximum day demand from the potable water system.

There is one remaining well site where property rights have been secured by the District. The District plans to conduct additional investigations using the finite element model recently developed by Brown and Caldwell to provide information regarding behavior of the groundwater basin. Once this work is completed, the District should have sufficient information to identify additional well sites and can investigate the drilling of additional test wells.

Figure 6-3. Projected Potable Water Demand vs. Proposed Production Capacity, 1995-2035



It should also be noted that some of the existing wells may be reaching the end of their useful lives towards the year 2025. Production from the wells should be monitored over time and redevelopment of existing wells may be necessary to maintain an adequate water supply. Of particular concern is the long-term viability of the existing Airport Well. The existing wellhole and casing are not completely vertical and there is a significant offset in the casing. As a result of this offset, the well shaft experiences accelerated wear and requires replacement every four years.

SECTION 7

WATER SHORTAGE CONTINGENCY PLAN

SECTION 7
WATER SHORTAGE CONTINGENCY PLANNING

The effective management of water supply shortages is an important responsibility of water agencies. Shortages may be caused by drought, failures of major water supply facilities, natural disasters, or other adverse conditions. Therefore, it is necessary to have an effective management program to mitigate water supply shortages.

As described in Section 6, the District uses groundwater as its sole source of supply. The Martis Valley Groundwater Basin has a storage volume of about 484,000 acre-feet (157,701 million gallons) and is able support annual withdrawals of at least 24,000 acre-feet (7,820 million gallons) per year. Based upon current withdrawals of about 2,412 million gallons per year, there is over 65 years worth of water supply available even if there was zero recharge of the groundwater basin. A three year minimum supply of 24,000 AFY has been assumed.

The most likely cause of a water supply shortage would be the failure of a major water supply facility such as a well, pump station or transmission pipeline. Such an occurrence could be caused by a number of factors including earthquake, fire or major equipment failure. As a result, water supply shortages are expected to be somewhat short in duration (days or possibly weeks), but may occur without any warning. The District's water system consists of five major components: control valve stations, groundwater wells, pipelines, pump stations and storage tanks. In May 2004, the District completed a ***Vulnerability Assessment*** that identified the number of customers that would be impacted by major failure of a given facility. In conjunction with the ***Vulnerability Assessment***, the District periodically updates its Emergency Response Plan which identifies actions to be taken in the event of a major failure of a given facility.

Historically, the water supply system has been most impacted by power outages. In response, the District has installed external generator connections and manual transfer switches at all of its pump stations and well sites. The District currently owns two large trailer-mounted portable generators that can be mobilized to any of the District's pump facilities in the event of a power outage. In addition, the District has installed permanently-mounted diesel-powered backup generators at 17 pump station sites. These generators are equipped with automatic transfer switches and will activate in the event of a power outage.

WATER CONSERVATION PROGRAM

Depending upon the type of water supply restriction, its location and the number of customers affected, it would be necessary for the District to implement some form of water conservation – either voluntary or mandatory. **Table 7-1** identifies the various stages of water conservation measures that would be implemented.

Table 7-1. Water Conservation Stages

Stage	Water Conservation Requirement	Compliance Level
1	Targeted 10% Reduction in Usage	Voluntary
2	Targeted 20% Reduction in Usage	Mandatory
3	Targeted 30% Reduction in Usage	Mandatory
4	Targeted 40% Reduction in Usage	Mandatory
5	Targeted 50% Reduction in Usage	Mandatory

Stage 1 Water Conservation

Stage 1 would apply during periods where up to 10 percent of the water supply is unavailable. A corresponding reduction in water usage of 10 percent would be required. This would be achieved through voluntary measures such as:

- Irrigation with potable water of ornamental landscapes and turf would be limited to every other day
- The application of potable water to driveways and sidewalks would be prohibited unless for driveway sealing or construction
- The use of a hose that dispenses potable water to wash a motor vehicle, except where the hose is fitted with a shut-off nozzle, would be prohibited

Stage 2 Water Conservation

Stage 2 would apply during periods where up to 20 percent of the water supply is unavailable. A corresponding reduction in water usage of 20 percent would be required. Compliance with water conservation requirements is mandatory for Stage 2 and above. Water conservation measures in Stage 2 include:

- Irrigation with potable water of ornamental landscapes and turf would be limited to every other day
- The application of potable water to driveways and sidewalks would be prohibited unless for driveway sealing or construction
- The use of a hose that dispenses potable water to wash a motor vehicle, except where the hose is fitted with a shut-off nozzle, would be prohibited
- Customers may be subject to fines and penalties for failure to comply with these requirements

Stage 3 Water Conservation

Stage 3 would apply during periods where up to 30 percent of the water supply is unavailable. A corresponding reduction in water usage of 30 percent would be required. Compliance is mandatory. Water conservation measures in Stage 3 include:

- Irrigation of ornamental landscapes and turf (using either potable or non-potable water) would be limited to 3-days per week
- The application of potable water to driveways and sidewalks would be prohibited
- The use of a hose that dispenses potable water to wash a motor vehicle, except where the hose is fitted with a shut-off nozzle, would be prohibited

- The District may install flow restricting devices on a customer's service
- Customers may be subject to fines and penalties for failure to comply with these requirements

Stage 4 Water Conservation

Stage 4 would apply during periods where up to 40 percent of the water supply is unavailable. A corresponding reduction in water usage of 40 percent would be required. Compliance is mandatory. Water conservation measures in Stage 4 include:

- Irrigation of ornamental landscapes and turf (using either potable or non-potable water) would be limited to 2-days per week
- The application of potable water to driveways and sidewalks would be prohibited
- The use of potable water to wash a motor vehicle, except where the hose is fitted with a shut-off nozzle, would be prohibited
- Any customer leak in plumbing and / or irrigation systems would be repaired when found, but in any case within ten (10) days of notice by the District to repair. The District may perform the repair or hire a contractor to perform the repair, and then invoice the customer for those costs
- The District may install flow restricting devices on a customer's service
- Customers may be subject to fines and penalties for failure to comply with this requirement

Stage 5 Water Conservation

Stage 5 would apply during periods where up to 50 percent of the water supply is unavailable. A corresponding reduction in water usage of 50 percent would be required. Compliance is mandatory. Water conservation measures in Stage 5 include:

- All outdoor water uses would be prohibited in the area affected by the water conservation requirement. The District may discontinue service to irrigation services
- Any customer leak in plumbing and / or irrigation systems would be repaired when found, but in any case within ten (10) days of notice by the District to repair. The District may perform the repair or hire a contractor to perform the repair, and then invoice the customer for those costs
- The District may install flow restricting devices on a customer's service
- The District may implement mandatory water rationing through the use of forced rolling outages

- Customers may be subject to fines and penalties for failure to comply with this requirement

Effectiveness of the Water Conservation Program

The District currently monitors total production for all sources on a daily basis. This monitoring would be the primary tool to gauge the effectiveness of the water conservation program. Total water production would be compared with production for the same time in prior years and with days prior to implementation of the water conservation program. Other measures would likely include drive-by inspections of customers to verify irrigation practices and monitoring of customer usage through the District's AMR system.

WATER CONSERVATION ORDINANCE

In September 2014, the District adopted Ordinance 2014-05 which describes the water conservation program to be implemented in the event of a water supply or drought emergency. A copy of the ordinance is given in Appendix D.

The ordinance outlines five stages of water alerts that describe different required conservation efforts. These conservation savings range from voluntary compliance with reasonable conservation efforts in Stage 1 to a mandatory 50 percent reduction in Stage 5. The ordinance authorizes the General Manager of the District to implement these measures immediately upon occurrence of an event requiring such conservation measures. A public meeting of the Board of Directors would then be scheduled as soon as possible to inform the Board and the public of the emergency, the actions taken by the District and the expected duration until the problem could be corrected.

POTENTIAL FINANCIAL IMPACTS

In 2009, the District retained HDR to perform a water rate study and assist in the development of the District's new metered rate structure. This new rate structure became effective in January of 2010. One of the major objectives in developing this new rate structure was to closely match the District's variable revenue stream with its variable expenses and to match its fixed revenue stream with its fixed expenses. About 85 percent of the Water Department's expenses are fixed and do not vary with the amount of water sold to customers. The remaining 15 percent of expenses is for the costs of pumping and treatment and will vary with customer usage.

HDR performed water rate study updates in 2013 and 2015. Water rates were adjusted based upon these studies but the basic concept of matching variable revenues with variable expenses and fixed revenues with fixed expenses was maintained.

In October 2014, the District implemented Stage 2 of its Water Shortage Contingency Plan. This was followed by the implementation of Stage 4 in June 2015. These actions were taken in response to mandates issued by the State of California. The District had adequate water supplies and was not experiencing a water shortage during this entire period.

For 2015, the financial impact of these actions was a reduction in revenue of about $172,500 for decreased water sales. This was about two percent of budgeted water sales revenue. There was corresponding reduction in operational expenses of about $197,000. This was about four percent of budgeted operational expenses. The District also incurred an additional $120,000 in expenses mainly related to increased public education efforts and increased labor for customer notification and customer service. These costs were covered by a reduction in planned capital expenditures and the use of reserves.

In the event that a prolonged Stage 5 conservation requirement (50 percent reduction in water usage) was imposed for a significant length of time (a number of months), the District would expect to see a revenue reduction of about six percent. Similar to 2015, there would be additional costs associated with public education, customer notification and customer service. There would also be a corresponding reduction in operational expenses associated with less water being treated and pumped to customers. Any remaining differences between revenue and expenses would likely be covered through the use of reserves. The District would then have to evaluate its overall financial situation during the next annual budget cycle. At that time, the District would review whether rate adjustments were necessary to ensure the financial stability of the Water Department.

In the event of a major water supply facility failure, unforeseen expenses can be expected. District staff and/or outside contractors may be required to work overtime and weekends to repair the damaged facility, install a temporary facility or adjust system operations in order to maintain water service to District customers. Similar to a drought-related water shortage, it is expected that the immediate cost impacts would be covered through the use of reserve funds. The District would then review its financial situation once the facility has been repaired.

SECTION 8

WATER DEMAND MANAGEMENT MEASURES

SECTION 8
WATER DEMAND MANAGEMENT MEASURES

Demand management, or water conservation, is frequently the lowest-cost resource available to a water agency. The goals of the District's water conservation program are to reduce demand for water at peak times, demonstrate continued commitment to appropriate demand management measures (DMMs) and to ensure a reliable future water supply.

The California Water Code requires that an Urban Water Management Plan discuss DMMs in seven areas:

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

WATER WASTE PREVENTION ORDINANCES

The District's Codes and Policies contain a provision whereby the District may disconnect water service to a customer that is found to be wasting water. Chapter 5.12.040 reads as follows:

> **5.12.040** **Discontinuance of Water Service by the District**
> **5.12.040.1** With notice - A customer's water service may be discontinued by the District upon at least five days' prior written notice in the event of:
> **5.12.040.1(A)** Non-payment of bills for water service at any location within 30 days of presentation;
> **5.12.040.1(B)** Violation of these codes;
> **5.12.040.1(C)** Negligent or wasteful use of water, as determined by the District.
> **5.12.040.1(D)** Failure to provide documents or payment as requested by a Notice to Comply. Requested items may include, but are not limited to, service applications, lease agreements, home ownership documents, signed payment agreement and payment by cash or money order for a check returned unpaid by the bank.

The District does not have any direct prohibitions on specific types of water usage and does not have an ordinance banning water softeners. Hardness and TDS levels in the District's water supply are low and the District is not aware of any water softeners installed by customers.

The Town of Truckee has also adopted water efficient landscape standards as required by California AB 1881. These requirements are given in Section 18.40.060 of the Town of Truckee Development Code.

METERING

In 2010, the District began reading all of its existing meters as required by AB 2572. As of January 1, 2016, over 95 percent of the residential accounts and all of the commercial accounts are equipped with a meter. The District currently anticipates that all water system customers will be equipped with a meter by December 2019. This is five years ahead of the deadline established by AB 2572.

The District has implemented volume-based billing for those customers equipped with a meter. For residential customers, the volume-based rate has a two-tier inclining block structure. For commercial customers, the volume-based rate has a single tier. There is no usage allowance for either customer class and all water used is billed to the customer.

CONSERVATION PRICING

As discussed above, the District has implemented volume-based billing for those customers equipped with a meter. For residential customers, the volume-based rate has a two-tier inclining block structure consistent with the requirements of Proposition 218. For commercial customers, the volume-based rate has a single tier. There is no usage allowance for either customer class and all water used is billed to the customer.

PUBLIC EDUCATION AND OUTREACH

The District conducts public education and information programs on water conservation through a number of means:

- **Bill Inserts:** The District periodically includes water conservation reminders with monthly service bills. The District also publishes a semi-annual newsletter that is mailed with a service bill.

- **Water Conservation Education/Handouts:** The District has developed water conservation information packets and brochures for community-wide distribution. Charts and handouts are also available that determine how much water is needed to water grasses Spring through Fall.

- **Print Advertising:** The District has developed a print ad series on Water Wise Landscaping practices that is published in local newspapers (Sierra Sun, Moonshine Ink, etc). This advertising is performed in cooperation with local landscape companies.

- **TV Commercials:** The District has produced television commercials asking District customers to voluntarily use landscape water wisely. These commercials were aired on the local cable public access channel.

- **School Education Programs**: The District funds the purchase of landscape water conservation educational materials that are distributed to local children through the Tahoe-Truckee Unified School District. In recent years, the District has partnered with the Sierra Watershed Education Partnership (SWEP) and the Truckee High School 'Envirolution Club' to distribute water-saving measures and information to every elementary school and middle school child in the District's territory through an innovative, and award winning, 'Trashion Show' format. The 'Trashion Shows' are general assembly presentations by the Envirolution Club members who make fashion outfits out of garbage and recycled materials with each outfit delivering an interpretive message on living sustainably (including water conservation).

- **Demonstration Gardens:** The District maintains a demonstration garden at its main office complex. The garden showcases ideas for creating a water-efficient garden and landscape plan using native and drought tolerant plants, bunch grass meadow replacements for lawns, hardscaping/mulching techniques, and water efficient irrigation. The District has also posted information and links regarding efficient landscaping on its web site. The District worked with the community to develop a low-water use demonstration garden at the former Tahoe Berry restaurant. This demonstration garden contains low-water using plant types as well as a drip irrigation system. The District also collaborated on the creation of a native species demonstration garden at Truckee High School.

- **Water-Wise Gardening Web-Based Resource**: In conjunction with the demonstration gardens, a web-based resource has been developed. This resource details the garden design, plant and material lists, gardening techniques, and other information intended to assist customers in conserving water for landscaping.

- **Landscaping and Irrigation Seminars:** In cooperation with local landscapers and nurseries, the District conducts periodic seminars on landscaping and irrigation practices appropriate for the local climate.

PROGRAMS TO ASSESS AND MANAGE DISTRIBUTION SYSTEM REAL LOSS

The District conducts a number of programs to identify and reduce water system losses:

- The District has an active leak repair program. Any reported or suspected leaks are verified by testing the water for chlorine residual. The leak is then excavated and repaired. During the Summer months, the District has a crew that spends about 90 percent of its time repairing leaks.

- The District has retained outside contractors to perform distribution system leak surveys. During the Summer of 2015, one field technician was assigned on a full-time basis to conduct leak surveys throughout the distribution system.

- For 2016, the District has budgeted for the purchase of a number of remote leak detection correlators. It is expected that deployment of this equipment will occur in the Summer of 2016.

- The District has an ongoing pipeline replacement program. Each Summer, the District awards one or more construction contracts for the replacement or rehabilitation of existing water pipelines that are in poor condition. Since 2007, the District has been able to replace about 67,250 feet of main.

- The District is in the process of installing water meters and pressure monitors on all of its wells, pump stations and control valve stations. Once these metering and monitor devices are installed, the District conducts area-specific mass-balances on a monthly basis to identify areas of concern. This information is used to set priorities for the field technician assigned to leak detection surveys.

WATER CONSERVATION PROGRAM COORDINATION AND STAFFING SUPPORT
The District has a Conservation Department consisting of three full-time staff members – the Conservation Manager, Conservation Administrator, and Conservation Program Specialist. These individuals are responsible for implementing and promoting the District's conservation programs for both its electric and water utilities. About one third of the staff time is spent on water conservation issues. The Conservation Manager serves as the Water Conservation Coordinator.

OTHER DEMAND MANAGEMENT MEASURES
The District conducts a number of other water conservation programs. These include:

- **High-Efficiency Washing Machine Rebates:** The District offers a rebate of $100 for the purchase of "energy star" clothes washers. The District has a simple one page form to be completed by the property owner, accompanied by a copy of the sales receipt. This rebate program has been advertised on inserts included with monthly bills for service. The District is working to expand this program to include high-efficiency washing machines.

- **Residential Ultra-Low-Flush Toilet Replacement Program:** The District offers a $100 rebate to those customers that replace an existing older toilet with a new toilet that uses 1.28 gallons per flush or less. Customers are required to provide the District with evidence that the old toilet has been removed from service and disposed of.

  The District has also created a partnership with a local plumbing supply company (Western Nevada Supply) where customers can bring their old toilet to the store and exchange it for a new water efficient replacement at no cost. There are two options available for direct exchange, or the customer may apply the $100 value towards the purchase of a more expensive toilet.

- **Water Leak Repair Rebate:** With implementation of the automated meter reading system, the District has been able to identify leaks on customer-owned piping. The District has developed procedures for notifying customers by telephone or letter depending upon the severity of the leak.

  The District has a Customer Leak Repair Rebate program to encourage customers to repair leaks on the customer-side of the meter. The District offers a rebate of up to $100 as an incentive towards repair of these leaks. To qualify for this rebate, customers must have received prior notification from the District regarding the leak, they must provide documentation regarding the leak itself and the cost to repair it, and the District must verify that the leak has been corrected.

- **Water Survey Programs for Residential Customers:** The District performs water surveys upon request of the property owner. The survey involves an inspection of the property along with recommendations for water conservation measures. Typical recommendations involve installation of low-flow showerheads, high-efficiency clothes washers, low-flow toilets and use of native plants for landscaping.

- **Residential Plumbing Retrofit:** Upon request, the District provides to its customers, at no charge, the following water conservation devices:

    - Low-flow showerheads
    - Faucet aerators
    - Sprinkler/rainfall measurement gauges
    - Low-flow outside hose nozzles

    The availability of these water conserving devices has been advertised on inserts included with monthly bills for service. For a number of years, the District also has sponsored a booth at the annual Truckee Home & Garden Show held on Memorial Day weekend. The District distributes water conservation literature, low-flow showerheads and sprinkler/rainfall measurement gauges at this booth along with information regarding the District's electricity conservation programs. The District has also maintained a table at 'Truckee Thursdays.' This is a weekly event held in downtown Truckee during the Summer to promote the local merchants and other local events.

- **Large Landscape Conservation Programs and Incentives:** The District distributes sprinkler/rainfall measurement gauges free of charge. Upon request of the property owner, the District will also make recommendations regarding landscaping and plants that are appropriate to the local climate. The District has also conducted a program where smart water controllers were installed on nine commercial properties. These water controllers utilize 2-way radio communication in conjunction with weather observations and evapo-transpiration data to optimize watering schedules.

- **Irrigation System Rain Sensors:** In response to the Emergency Drought Regulations, the District launched a new program in 2015 whereby rain sensors are distributed at no charge. These sensors interact with automated sprinkler control systems to prevent irrigation during and 48 hours after measurable precipitation events.

WATER CONSERVATION DMM EFFECTIVENESS

As discussed in Section 4, there has been an ongoing decrease in potable water production over the past few years. As discussed in Section 5, the District has met its water demand reduction requirements under SB X7-7.

The District intends to continue the DMMs and programs described above. In addition, the District will continue to identify additional water conservation programs and implement these programs when they are cost effective.

APPENDIX A

TEXT OF THE URBAN WATER MANAGEMENT PLANNING ACT

California Water Code Division 6, Part 2.6.

Chapter 1. General Declaration and Policy §10610-10610.4
Chapter 2. Definitions §10611-10617
Chapter 3. Urban Water Management Plans
Article 1. General Provisions §10620-10621
Article 2. Contents of Plans §10630-10634
Article 2.5. Water Service Reliability §10635
Article 3. Adoption And Implementation of Plans §10640-10645
Chapter 4. Miscellaneous Provisions §10650-10656

Chapter 1. General Declaration and Policy

SECTION 10610-10610.4

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Chapter 2. Definitions

SECTION 10611-10617

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

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

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

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

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

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

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

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

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

Chapter 3. Urban Water Management Plans

Article 1. General Provisions

SECTION 10620-10621

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

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

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

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

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

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

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

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

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

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

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

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

Article 2. Contents of Plan

SECTION 10630-10634

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

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

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

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

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

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

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

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

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

(A) An average water year.

(B) A single-dry water year.

(C) Multiple-dry water years.

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

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

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

(A) Single-family residential.

(B) Multifamily.

(C) Commercial.

(D) Industrial.

(E) Institutional and governmental.

(F) Landscape.

(G) Sales to other agencies.

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

(I) Agricultural.

(J) Distribution system water loss.

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

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

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

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

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

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

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

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

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

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

(i) Water waste prevention ordinances.

(ii) Metering.

(iii) Conservation pricing.

(iv) Public education and outreach.

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

(vi) Water conservation program coordination and staffing support.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(i) Compliance on an individual basis.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Article 2.5. Water Service Reliability

SECTION 10635

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

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

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

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

Article 3. Adoption and Implementation of Plans

SECTION 10640-10645

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

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

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

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

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

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

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

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

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

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

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

(2) The department shall distribute to the panel convened pursuant to Section 10631.7 the results achieved by the implementation of those water demand management measures described in paragraph (1).

(3) The department shall make available to the public the standard the department will use to identify exemplary water demand management measures.

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

Chapter 4. Miscellaneous Provisions

SECTION 10650-10656

10650. Any actions or proceedings to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(a) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part.

(b) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be commenced within 90 days after filing of the plan or amendment thereto pursuant to Section 10644 or the taking of that action.

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

10652. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans pursuant to this part or to the implementation of actions taken pursuant to Section 10632. Nothing in this part shall be interpreted as exempting from the California Environmental Quality Act any project that would significantly affect water supplies for fish and wildlife, or any project for implementation of the plan, other than projects implementing Section 10632, or any project for expanded or additional water supplies.

10653. The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the State Water Resources Control Board and the Public Utilities Commission, for the preparation of water management plans or conservation plans; provided, that if the State Water Resources Control Board or the Public Utilities Commission requires additional information concerning water conservation to implement its existing authority, nothing in this part shall be deemed to limit the board or the commission in obtaining that information. The requirements of this part shall be satisfied by any urban water demand management plan prepared to meet federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing urban water management plan which includes the contents of a plan required under this part.

10654. An urban water supplier may recover in its rates the costs incurred in preparing its plan and implementing the reasonable water conservation measures included in the plan. Any best water management practice that is included in the plan that is identified in the "Memorandum of Understanding Regarding Urban Water Conservation in California" is deemed to be reasonable for the purposes of this section.

10655. If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

10656. An urban water supplier that does not prepare, adopt, and submit its urban water management plan to the department in accordance with this part, is ineligible to receive funding pursuant to Division 24 (commencing with Section 78500) or Division 26 (commencing with Section 79000), or receive drought assistance from the state until the urban water management plan is submitted pursuant to this article.

APPENDIX B

WATER CONSERVATION ACT OF 2009

California Water Code Division 6, Part 2.55.

Chapter 1. General Declarations and Policy §10608-10608.8
Chapter 2. Definitions §10608.12
Chapter 3. Urban Retail Water Suppliers §10608.16-10608.44
Chapter 4. Agricultural Water Suppliers §10608.48
Chapter 5. Sustainable Water Management §10608.50
Chapter 6 Standardized Data Collection §10608.52
Chapter 7 Funding Provisions §10608.56-10608.60
Chapter 8 Quantifying Agricultural Water Use Efficiency §10608.64

Chapter 1. General Declarations and Policy

SECTION 10608-10608.8

10608. The Legislature finds and declares all of the following:

(a) Water is a public resource that the California Constitution protects against waste and unreasonable use.

(b) Growing population, climate change, and the need to protect and grow California's economy while protecting and restoring our fish and wildlife habitats make it essential that the state manage its water resources as efficiently as possible.

(c) Diverse regional water supply portfolios will increase water supply reliability and reduce dependence on the Delta.

(d) Reduced water use through conservation provides significant energy and environmental benefits, and can help protect water quality, improve streamflows, and reduce greenhouse gas emissions.

(e) The success of state and local water conservation programs to increase efficiency of water use is best determined on the basis of measurable outcomes related to water use or efficiency.

(f) Improvements in technology and management practices offer the potential for increasing water efficiency in California over time, providing an essential water management tool to meet the need for water for urban, agricultural, and environmental uses.

(g) The Governor has called for a 20 percent per capita reduction in urban water use statewide by 2020.

(h) The factors used to formulate water use efficiency targets can vary significantly from location to location based on factors including weather, patterns of urban and suburban development, and past efforts to enhance water use efficiency.

(i) Per capita water use is a valid measure of a water provider's efforts to reduce urban water use within its service area. However, per capita water use is less useful for measuring relative water use efficiency between different water providers. Differences in weather, historical patterns of urban and suburban development, and density of housing in a particular location need to be considered when assessing per capita water use as a measure of efficiency.

10608.4. It is the intent of the Legislature, by the enactment of this part, to do all of the following:

(a) Require all water suppliers to increase the efficiency of use of this essential resource.

(b) Establish a framework to meet the state targets for urban water conservation identified in this part and called for by the Governor.

(c) Measure increased efficiency of urban water use on a per capita basis.

(d) Establish a method or methods for urban retail water suppliers to determine targets for achieving increased water use efficiency by the year 2020, in accordance with the Governor's goal of a 20-percent reduction.

(e) Establish consistent water use efficiency planning and implementation standards for urban water suppliers and agricultural water suppliers.

(f) Promote urban water conservation standards that are consistent with the California Urban Water Conservation Council's adopted best management practices and the requirements for demand management in Section 10631.

(g) Establish standards that recognize and provide credit to water suppliers that made substantial capital investments in urban water conservation since the drought of the early 1990s.

(h) Recognize and account for the investment of urban retail water suppliers in providing recycled water for beneficial uses.

(i) Require implementation of specified efficient water management practices for agricultural water suppliers.

(j) Support the economic productivity of California's agricultural, commercial, and industrial sectors.

(k) Advance regional water resources management.

10608.8. (a) (1) Water use efficiency measures adopted and implemented pursuant to this part or Part 2.8 (commencing with Section 10800) are water conservation measures subject to the protections provided under Section 1011.

(2) Because an urban agency is not required to meet its urban water use target until 2020 pursuant to subdivision (b) of Section 10608.24, an urban retail water supplier's failure to meet those targets shall not establish a violation of law for purposes of any state administrative or judicial proceeding prior to

January 1, 2021. Nothing in this paragraph limits the use of data reported to the department or the board in litigation or an administrative proceeding. This paragraph shall become inoperative on January 1, 2021.

(3) To the extent feasible, the department and the board shall provide for the use of water conservation reports required under this part to meet the requirements of Section 1011 for water conservation reporting.

(b) This part does not limit or otherwise affect the application of Chapter 3.5 (commencing with Section 11340), Chapter 4 (commencing with Section 11370), Chapter 4.5 (commencing with Section 11400), and Chapter 5 (commencing with Section 11500) of Part 1 of Division 3 of Title 2 of the Government Code.

(c) This part does not require a reduction in the total water used in the agricultural or urban sectors, because other factors, including, but not limited to, changes in agricultural economics or population growth may have greater effects on water use. This part does not limit the economic productivity of California's agricultural, commercial, or industrial sectors.

(d) The requirements of this part do not apply to an agricultural water supplier that is a party to the Quantification Settlement Agreement, as defined in subdivision (a) of Section 1 of Chapter 617 of the Statutes of 2002, during the period within which the Quantification Settlement Agreement remains in effect. After the expiration of the Quantification Settlement Agreement, to the extent conservation water projects implemented as part of the Quantification Settlement Agreement remain in effect, the conserved water created as part of those projects shall be credited against the obligations of the agricultural water supplier pursuant to this part.

Chapter 2 Definitions

SECTION 10608.12

10608.12. Unless the context otherwise requires, the following definitions govern the construction of this part:

(a) "Agricultural water supplier" means a water supplier, either publicly or privately owned, providing water to 10,000 or more irrigated acres, excluding recycled water. "Agricultural water supplier" includes a supplier or contractor for water, regardless of the basis of right, that distributes or sells water for ultimate resale to customers. "Agricultural water supplier" does not include the department.

(b) "Base daily per capita water use" means any of the following:

(1) The urban retail water supplier's estimate of its average gross water use, reported in gallons per capita per day and calculated over a continuous 10-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

(2) For an urban retail water supplier that meets at least 10 percent of its 2008 measured retail water demand through recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier, the urban retail water supplier may extend the calculation described in paragraph (1) up to an additional five years to a maximum of a continuous 15-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

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

(c) "Baseline commercial, industrial, and institutional water use" means an urban retail water supplier's base daily per capita water use for commercial, industrial, and institutional users.

(d) "Commercial water user" means a water user that provides or distributes a product or service.

(e) "Compliance daily per capita water use" means the gross water use during the final year of the reporting period, reported in gallons per capita per day.

(f) "Disadvantaged community" means a community with an annual median household income that is less than 80 percent of the statewide annual median household income.

(g) "Gross water use" means the total volume of water, whether treated or untreated, entering the distribution system of an urban retail water supplier, excluding all of the following:

(1) Recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier.

(2) The net volume of water that the urban retail water supplier places into long-term storage.

(3) The volume of water the urban retail water supplier conveys for use by another urban water supplier.

(4) The volume of water delivered for agricultural use, except as otherwise provided in subdivision (f) of Section 10608.24.

(h) "Industrial water user" means a water user that is primarily a manufacturer or processor of materials as defined by the North American Industry Classification System code sectors 31 to 33, inclusive, or an entity that is a water user primarily engaged in research and development.

(i) "Institutional water user" means a water user dedicated to public service. This type of user includes, among other users, higher education institutions, schools, courts, churches, hospitals, government facilities, and nonprofit research institutions.

(j) "Interim urban water use target" means the midpoint between the urban retail water supplier's base daily per capita water use and the urban retail water supplier's urban water use target for 2020.

(k) "Locally cost effective" means that the present value of the local benefits of implementing an agricultural efficiency water management practice is greater than or equal to the present value of the local cost of implementing that measure.

(l) "Process water" means water used for producing a product or product content or water used for research and development, including, but not limited to, continuous manufacturing processes, water used for testing and maintaining equipment used in producing a product or product content, and water used in combined heat and power facilities used in producing a product or product content. Process water does not mean incidental water uses not related to the production of a product or product content, including, but not limited to, water used for restrooms, landscaping, air conditioning, heating, kitchens, and laundry.

(m) "Recycled water" means recycled water, as defined in subdivision (n) of Section 13050, that is used to offset potable demand, including recycled water supplied for direct use and indirect potable reuse, that meets the following requirements, where applicable:

(1) For groundwater recharge, including recharge through spreading basins, water supplies that are all of the following:

(A) Metered.

(B) Developed through planned investment by the urban water supplier or a wastewater treatment agency.

(C) Treated to a minimum tertiary level.

(D) Delivered within the service area of an urban retail water supplier or its urban wholesale water supplier that helps an urban retail water supplier meet its urban water use target.

(2) For reservoir augmentation, water supplies that meet the criteria of paragraph (1) and are conveyed through a distribution system constructed specifically for recycled water.

(n) "Regional water resources management" means sources of supply resulting from watershed-based planning for sustainable local water reliability or any of the following alternative sources of water:

(1) The capture and reuse of stormwater or rainwater.

(2) The use of recycled water.

(3) The desalination of brackish groundwater.

(4) The conjunctive use of surface water and groundwater in a manner that is consistent with the safe yield of the groundwater basin.

(o) "Reporting period" means the years for which an urban retail water supplier reports compliance with the urban water use targets.

(p) "Urban retail water supplier" means a water supplier, either publicly or privately owned, that directly provides potable municipal water to more than 3,000 end users or that supplies more than 3,000 acre-feet of potable water annually at retail for municipal purposes.

(q) "Urban water use target" means the urban retail water supplier's targeted future daily per capita water use.

(r) "Urban wholesale water supplier," means a water supplier, either publicly or privately owned, that provides more than 3,000 acre-feet of water annually at wholesale for potable municipal purposes.

Chapter 3 Urban Retail Water Suppliers

SECTION 10608.16-10608.44

10608.16.(a) The state shall achieve a 20-percent reduction in urban per capita water use in California on or before December 31, 2020.

(b) The state shall make incremental progress towards the state target specified in subdivision (a) by reducing urban per capita water use by at least 10 percent on or before December 31, 2015.

10608.20.(a) (1) Each urban retail water supplier shall develop urban water use targets and an interim urban water use target by July 1, 2011. Urban retail water suppliers may elect to determine and report progress toward achieving these targets on an individual or regional basis, as provided in subdivision (a) of Section 10608.28, and may determine the targets on a fiscal year or calendar year basis.

(2) It is the intent of the Legislature that the urban water use targets described in paragraph (1) cumulatively result in a 20-percent reduction from the baseline daily per capita water use by December 31, 2020.

(b) An urban retail water supplier shall adopt one of the following methods for determining its urban water use target pursuant to subdivision (a):

(1) Eighty percent of the urban retail water supplier's baseline per capita daily water use.

(2) The per capita daily water use that is estimated using the sum of the following performance standards:

(A) For indoor residential water use, 55 gallons per capita daily water use as a provisional standard. Upon completion of the department's 2016 report to the Legislature pursuant to Section 10608.42, this standard may be adjusted by the Legislature by statute.

(B) For landscape irrigated through dedicated or residential meters or connections, water efficiency equivalent to the standards of the Model Water Efficient Landscape Ordinance set forth in Chapter 2.7 (commencing with Section 490) of Division 2 of Title 23 of the California Code of Regulations, as in effect the later of the year of the landscape's installation or 1992. An urban retail water supplier using the approach specified in this subparagraph shall use satellite imagery, site visits, or other best available technology to develop an accurate estimate of landscaped areas.

(C) For commercial, industrial, and institutional uses, a 10-percent reduction in water use from the baseline commercial, industrial, and institutional water use by 2020.

(3) Ninety-five percent of the applicable state hydrologic region target, as set forth in the state's draft 20x2020 Water Conservation Plan (dated April 30, 2009). If the service area of an urban water supplier includes more than one hydrologic region, the supplier shall apportion its service area to each region based on population or area.

(4) A method that shall be identified and developed by the department, through a public process, and reported to the Legislature no later than December 31, 2010. The method developed by the department shall identify per capita targets that cumulatively result in a statewide 20-percent reduction in urban daily per capita water use by December 31, 2020. In developing urban daily per capita water use targets, the department shall do all of the following:

(A) Consider climatic differences within the state.

(B) Consider population density differences within the state.

(C) Provide flexibility to communities and regions in meeting the targets.

(D) Consider different levels of per capita water use according to plant water needs in different regions.

(E) Consider different levels of commercial, industrial, and institutional water use in different regions of the state.

(F) Avoid placing an undue hardship on communities that have implemented conservation measures or taken actions to keep per capita water use low.

(c) If the department adopts a regulation pursuant to paragraph (4) of subdivision (b) that results in a requirement that an urban retail water supplier achieve a reduction in daily per capita water use that is greater than 20 percent by December 31, 2020, an urban retail water supplier that adopted the method described in paragraph (4) of subdivision (b) may limit its urban water use target to a reduction of not more than 20 percent by December 31, 2020, by adopting the method described in paragraph (1) of subdivision (b).

(d) The department shall update the method described in paragraph (4) of subdivision (b) and report to the Legislature by December 31, 2014. An urban retail water supplier that adopted the method described in paragraph (4) of subdivision (b) may adopt a new urban daily per capita water use target pursuant to this updated method.

(e) An urban retail water supplier shall include in its urban water management plan due in 2010 pursuant to Part 2.6 (commencing with Section 10610) the baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.

(f) When calculating per capita values for the purposes of this chapter, an urban retail water supplier shall determine population using federal, state, and local population reports and projections.

(g) An urban retail water supplier may update its 2020 urban water use target in its 2015 urban water management plan required pursuant to Part 2.6 (commencing with Section 10610).

(h) (1) The department, through a public process and in consultation with the California Urban Water Conservation Council, shall develop technical methodologies and criteria for the consistent implementation of this part, including, but not limited to, both of the following:

(A) Methodologies for calculating base daily per capita water use, baseline commercial, industrial, and institutional water use, compliance daily per capita water use, gross water use, service area population, indoor residential water use, and landscaped area water use.

(B) Criteria for adjustments pursuant to subdivisions (d) and (e) of Section 10608.24.

(2) The department shall post the methodologies and criteria developed pursuant to this subdivision on its Internet Web site, and make written copies available, by October 1, 2010. An urban retail water supplier shall use the methods developed by the department in compliance with this part.

(i) (1) The department shall adopt regulations for implementation of the provisions relating to process water in accordance with subdivision (l) of Section 10608.12, subdivision (e) of Section 10608.24, and subdivision (d) of Section 10608.26.

(2) The initial adoption of a regulation authorized by this subdivision is deemed to address an emergency, for purposes of Sections 11346.1 and 11349.6 of the Government Code, and the department is hereby exempted for that purpose from the requirements of subdivision (b) of Section 11346.1 of the

Government Code. After the initial adoption of an emergency regulation pursuant to this subdivision, the department shall not request approval from the Office of Administrative Law to readopt the regulation as an emergency regulation pursuant to Section 11346.1 of the Government Code.

(j) (1) An urban retail water supplier is granted an extension to July 1, 2011, for adoption of an urban water management plan pursuant to Part 2.6 (commencing with Section 10610) due in 2010 to allow the use of technical methodologies developed by the department pursuant to paragraph (4) of subdivision (b) and subdivision (h). An urban retail water supplier that adopts an urban water management plan due in 2010 that does not use the methodologies developed by the department pursuant to subdivision (h) shall amend the plan by July 1, 2011, to comply with this part.

(2) An urban wholesale water supplier whose urban water management plan prepared pursuant to Part 2.6 (commencing with Section 10610) was due and not submitted in 2010 is granted an extension to July 1, 2011, to permit coordination between an urban wholesale water supplier and urban retail water suppliers.

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

10608.24.(a) Each urban retail water supplier shall meet its interim urban water use target by December 31, 2015.

(b) Each urban retail water supplier shall meet its urban water use target by December 31, 2020.

(c) An urban retail water supplier's compliance daily per capita water use shall be the measure of progress toward achievement of its urban water use target.

(d) (1) When determining compliance daily per capita water use, an urban retail water supplier may consider the following factors:

(A) Differences in evapotranspiration and rainfall in the baseline period compared to the compliance reporting period.

(B) Substantial changes to commercial or industrial water use resulting from increased business output and economic development that have occurred during the reporting period.

(C) Substantial changes to institutional water use resulting from fire suppression services or other extraordinary events, or from new or expanded operations, that have occurred during the reporting period.

(2) If the urban retail water supplier elects to adjust its estimate of compliance daily per capita water use due to one or more of the factors described in

paragraph (1), it shall provide the basis for, and data supporting, the adjustment in the report required by Section 10608.40.

(e) When developing the urban water use target pursuant to Section 10608.20, an urban retail water supplier that has a substantial percentage of industrial water use in its service area may exclude process water from the calculation of gross water use to avoid a disproportionate burden on another customer sector.

(f) (1) An urban retail water supplier that includes agricultural water use in an urban water management plan pursuant to Part 2.6 (commencing with Section 10610) may include the agricultural water use in determining gross water use. An urban retail water supplier that includes agricultural water use in determining gross water use and develops its urban water use target pursuant to paragraph (2) of subdivision (b) of Section 10608.20 shall use a water efficient standard for agricultural irrigation of 100 percent of reference evapotranspiration multiplied by the crop coefficient for irrigated acres.

(2) An urban retail water supplier, that is also an agricultural water supplier, is not subject to the requirements of Chapter 4 (commencing with Section 10608.48), if the agricultural water use is incorporated into its urban water use target pursuant to paragraph (1).

10608.26.(a) In complying with this part, an urban retail water supplier shall conduct at least one public hearing to accomplish all of the following:

(1) Allow community input regarding the urban retail water supplier's implementation plan for complying with this part.

(2) Consider the economic impacts of the urban retail water supplier's implementation plan for complying with this part.

(3) Adopt a method, pursuant to subdivision (b) of Section 10608.20, for determining its urban water use target.

(b) In complying with this part, an urban retail water supplier may meet its urban water use target through efficiency improvements in any combination among its customer sectors. An urban retail water supplier shall avoid placing a disproportionate burden on any customer sector.

(c) For an urban retail water supplier that supplies water to a United States Department of Defense military installation, the urban retail water supplier's implementation plan for complying with this part shall consider the conservation of that military installation under federal Executive Order 13514.

(d) (1) Any ordinance or resolution adopted by an urban retail water supplier after the effective date of this section shall not require existing customers as of the effective date of this section, to undertake changes in product formulation, operations, or equipment that would reduce process water use, but may provide technical assistance and financial incentives to those customers to implement efficiency measures for process water. This section shall not limit an ordinance or resolution adopted pursuant to a declaration of drought emergency by an urban retail water supplier.

(2) This part shall not be construed or enforced so as to interfere with the requirements of Chapter 4 (commencing with Section 113980) to Chapter 13 (commencing with Section 114380), inclusive, of Part 7 of Division 104 of the Health and Safety Code, or any requirement or standard for the protection of public health, public safety, or worker safety established by federal, state, or local government or recommended by recognized standard setting organizations or trade associations.

10608.28.(a) An urban retail water supplier may meet its urban water use target within its retail service area, or through mutual agreement, by any of the following:

(1) Through an urban wholesale water supplier.

(2) Through a regional agency authorized to plan and implement water conservation, including, but not limited to, an agency established under the Bay Area Water Supply and Conservation Agency Act (Division 31 (commencing with Section 81300)).

(3) Through a regional water management group as defined in Section 10537.

(4) By an integrated regional water management funding area.

(5) By hydrologic region.

(6) Through other appropriate geographic scales for which computation methods have been developed by the department.

(b) A regional water management group, with the written consent of its member agencies, may undertake any or all planning, reporting, and implementation functions under this chapter for the member agencies that consent to those activities. Any data or reports shall provide information both for the regional water management group and separately for each consenting urban retail water supplier and urban wholesale water supplier.

10608.32. All costs incurred pursuant to this part by a water utility regulated by the Public Utilities Commission may be recoverable in rates subject to review and approval by the Public Utilities Commission, and may be recorded in a memorandum account and reviewed for reasonableness by the Public Utilities Commission.

10608.36. Urban wholesale water suppliers shall include in the urban water management plans required pursuant to Part 2.6 (commencing with Section 10610) an assessment of their present and proposed future measures, programs, and policies to help achieve the water use reductions required by this part.

10608.40. Urban water retail suppliers shall report to the department on their progress in meeting their urban water use targets as part of their urban water management plans submitted pursuant to Section 10631. The data shall be reported using a standardized form developed pursuant to Section 10608.52.

10608.42.(a) The department shall review the 2015 urban water management plans and report to the Legislature by July 1, 2017, on progress towards achieving a 20-percent reduction in urban water use by December 31, 2020. The report shall include recommendations on changes to water efficiency standards or urban water use targets to achieve the 20-percent reduction and to reflect updated efficiency information and technology changes.

(b) A report to be submitted pursuant to subdivision (a) shall be submitted in compliance with Section 9795 of the Government Code.

10608.43. The department, in conjunction with the California Urban Water Conservation Council, by April 1, 2010, shall convene a representative task force consisting of academic experts, urban retail water suppliers, environmental organizations, commercial water users, industrial water users, and institutional water users to develop alternative best management practices for commercial, industrial, and institutional users and an assessment of the potential statewide water use efficiency improvement in the commercial, industrial, and institutional sectors that would result from implementation of these best management practices. The taskforce, in conjunction with the department, shall submit a report to the Legislature by April 1, 2012, that shall include a review of multiple sectors within commercial, industrial, and institutional users and that shall recommend water use efficiency standards for commercial, industrial, and institutional users among various sectors of water use. The report shall include, but not be limited to, the following:

(a) Appropriate metrics for evaluating commercial, industrial, and institutional water use.

(b) Evaluation of water demands for manufacturing processes, goods, and cooling.

(c) Evaluation of public infrastructure necessary for delivery of recycled water to the commercial, industrial, and institutional sectors.

(d) Evaluation of institutional and economic barriers to increased recycled water use within the commercial, industrial, and institutional sectors.

(e) Identification of technical feasibility and cost of the best management practices to achieve more efficient water use statewide in the commercial, industrial, and institutional sectors that is consistent with the public interest and reflects past investments in water use efficiency.

10608.44. Each state agency shall reduce water use at facilities it operates to support urban retail water suppliers in meeting the target identified in Section 10608.16.

Chapter 4 Agricultural Water Suppliers

SECTION 10608.48

10608.48.(a) On or before July 31, 2012, an agricultural water supplier shall implement efficient water management practices pursuant to subdivisions (b) and (c).

(b) Agricultural water suppliers shall implement all of the following critical efficient management practices:

(1) Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2).

(2) Adopt a pricing structure for water customers based at least in part on quantity delivered.

(c) Agricultural water suppliers shall implement additional efficient management practices, including, but not limited to, practices to accomplish all of the following, if the measures are locally cost effective and technically feasible:

(1) Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.

(2) Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.

(3) Facilitate the financing of capital improvements for on-farm irrigation systems.

(4) Implement an incentive pricing structure that promotes one or more of the following goals:

(A) More efficient water use at the farm level.

(B) Conjunctive use of groundwater.

(C) Appropriate increase of groundwater recharge.

(D) Reduction in problem drainage.

(E) Improved management of environmental resources.

(F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.

(5) Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance, and reduce seepage.

(6) Increase flexibility in water ordering by, and delivery to, water customers within operational limits.

(7) Construct and operate supplier spill and tailwater recovery systems.

(8) Increase planned conjunctive use of surface water and groundwater within the supplier service area.

(9) Automate canal control structures.

(10) Facilitate or promote customer pump testing and evaluation.

(11) Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports.

(12) Provide for the availability of water management services to water users. These services may include, but are not limited to, all of the following:

(A) On-farm irrigation and drainage system evaluations.

(B) Normal year and real-time irrigation scheduling and crop evapotranspiration information.

(C) Surface water, groundwater, and drainage water quantity and quality data.

(D) Agricultural water management educational programs and materials for farmers, staff, and the public.

(13) Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.

(14) Evaluate and improve the efficiencies of the supplier's pumps.

(d) Agricultural water suppliers shall include in the agricultural water management plans required pursuant to Part 2.8 (commencing with Section 10800) a report on which efficient water management practices have been implemented and are planned to be implemented, an estimate of the water use efficiency improvements that have occurred since the last report, and an estimate of the water use efficiency improvements estimated to occur five and 10 years in the future. If an agricultural water supplier determines that an efficient water management practice is not locally cost effective or technically feasible, the supplier shall submit information documenting that determination.

(e) The data shall be reported using a standardized form developed pursuant to Section 10608.52.

(f) An agricultural water supplier may meet the requirements of subdivisions (d) and (e) by submitting to the department a water conservation plan submitted to the United States Bureau of Reclamation that meets the requirements described in Section 10828.

(g) On or before December 31, 2013, December 31, 2016, and December 31, 2021, the department, in consultation with the board, shall submit to the Legislature a report on the agricultural efficient water management practices that have been implemented and are planned to be implemented and an assessment of the manner in which the implementation of those efficient water management practices has affected and will affect agricultural operations, including estimated water use efficiency improvements, if any.

(h) The department may update the efficient water management practices required pursuant to subdivision (c), in consultation with the Agricultural Water Management Council, the United States Bureau of Reclamation, and the board. All efficient water management practices for agricultural water use pursuant to this chapter shall be adopted or revised by the department only after the department conducts public hearings to allow participation of the diverse geographical areas and interests of the state.

(i) (1) The department shall adopt regulations that provide for a range of options that agricultural water suppliers may use or implement to comply with the measurement requirement in paragraph (1) of subdivision (b).

(2) The initial adoption of a regulation authorized by this subdivision is deemed to address an emergency, for purposes of Sections 11346.1 and 11349.6 of the Government Code, and the department is hereby exempted for that purpose from the requirements of subdivision (b) of Section 11346.1 of the Government Code. After the initial adoption of an emergency regulation pursuant to this subdivision, the department shall not request approval from the Office of Administrative Law to readopt the regulation as an emergency regulation pursuant to Section 11346.1 of the Government Code.

Chapter 5 Sustainable Water Management

Section 10608.50

10608.50.(a) The department, in consultation with the board, shall promote implementation of regional water resources management practices through increased incentives and removal of barriers consistent with state and federal law. Potential changes may include, but are not limited to, all of the following:

(1) Revisions to the requirements for urban and agricultural water management plans.

(2) Revisions to the requirements for integrated regional water management plans.

(3) Revisions to the eligibility for state water management grants and loans.

(4) Revisions to state or local permitting requirements that increase water supply opportunities, but do not weaken water quality protection under state and federal law.

(5) Increased funding for research, feasibility studies, and project construction.

(6) Expanding technical and educational support for local land use and water management agencies.

(b) No later than January 1, 2011, and updated as part of the California Water Plan, the department, in consultation with the board, and with public input, shall propose new statewide targets, or review and update existing statewide targets, for regional water resources management practices, including, but not limited to, recycled water, brackish groundwater desalination, and infiltration and direct use of urban stormwater runoff.

Chapter 6 Standardized Data Collection

SECTION 10608.52

10608.52.(a) The department, in consultation with the board, the California Bay-Delta Authority or its successor agency, the State Department of Public Health, and the Public Utilities Commission, shall develop a single standardized water use reporting form to meet the water use information needs of each agency, including the needs of urban water suppliers that elect to determine and report progress toward achieving targets on a regional basis as provided in subdivision (a) of Section 10608.28.

(b) At a minimum, the form shall be developed to accommodate information sufficient to assess an urban water supplier's compliance with conservation targets pursuant to Section 10608.24 and an agricultural water supplier's compliance with implementation of efficient water management practices pursuant to subdivision (a) of Section 10608.48. The form shall accommodate reporting by urban water suppliers on an individual or regional basis as provided in subdivision (a) of Section 10608.28.

Chapter 7 Funding Provisions

Section 10608.56-10608.60

10608.56.(a) On and after July 1, 2016, an urban retail water supplier is not eligible for a water grant or loan awarded or administered by the state unless the supplier complies with this part.

(b) On and after July 1, 2013, an agricultural water supplier is not eligible for a water grant or loan awarded or administered by the state unless the supplier complies with this part.

(c) Notwithstanding subdivision (a), the department shall determine that an urban retail water supplier is eligible for a water grant or loan even though the supplier has not met the per capita reductions required pursuant to Section 10608.24, if the urban retail water supplier has submitted to the department for approval a schedule, financing plan, and budget, to be included in the grant or loan agreement, for achieving the per capita reductions. The supplier may request grant or loan funds to achieve the per capita reductions to the extent the request is consistent with the eligibility requirements applicable to the water funds.

(d) Notwithstanding subdivision (b), the department shall determine that an agricultural water supplier is eligible for a water grant or loan even though the supplier is not implementing all of the efficient water management practices described in Section 10608.48, if the agricultural water supplier has submitted to the department for approval a schedule, financing plan, and budget, to be included in the grant or loan agreement, for implementation of the efficient water management practices. The supplier may request grant or loan funds to implement the efficient water management practices to the extent the request is consistent with the eligibility requirements applicable to the water funds.

(e) Notwithstanding subdivision (a), the department shall determine that an urban retail water supplier is eligible for a water grant or loan even though the supplier has not met the per capita reductions required pursuant to Section 10608.24, if the urban retail water supplier has submitted to the department for approval documentation demonstrating that its entire service area qualifies as a disadvantaged community.

(f) The department shall not deny eligibility to an urban retail water supplier or agricultural water supplier in compliance with the requirements of this part and Part 2.8 (commencing with Section 10800), that is participating in a multiagency water project, or an integrated regional water management plan, developed pursuant to Section 75026 of the Public Resources Code, solely on the basis that one or more of the agencies participating in the project or plan is not implementing all of the requirements of this part or Part 2.8 (commencing with Section 10800).

10608.60.(a) It is the intent of the Legislature that funds made available by Section 75026 of the Public Resources Code should be expended, consistent with Division 43 (commencing with Section 75001) of the Public Resources Code and upon appropriation by the Legislature, for grants to implement this part. In the allocation of funding, it is the intent of the Legislature that the department give consideration to disadvantaged communities to assist in implementing the requirements of this part.

(b) It is the intent of the Legislature that funds made available by Section 75041 of the Public Resources Code, should be expended, consistent with Division 43 (commencing with Section 75001) of the Public Resources Code and upon appropriation by the Legislature, for direct expenditures to implement this part.

Chapter 8 Quantifying Agricultural Water Use Efficiency

SECTION 10608.64

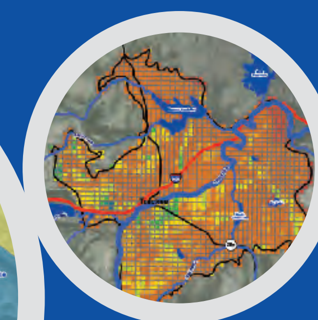
10608.64. The department, in consultation with the Agricultural Water Management Council, academic experts, and other stakeholders, shall develop a methodology for quantifying the efficiency of agricultural water use. Alternatives to be assessed shall include, but not be limited to, determination of efficiency levels based on crop type or irrigation system distribution uniformity. On or before December 31, 2011, the department shall report to the Legislature on a proposed methodology and a plan for implementation. The plan shall include the estimated implementation costs and the types of data needed to support the methodology. Nothing in this section authorizes the department to implement a methodology established pursuant to this section.

APPENDIX C

MANAGEMENT PLAN FOR THE MARTIS VALLEY GROUNDWATER BASIN

Martis Valley Groundwater Management Plan

April, 2013



Prepared for

Northstar Community Services District

Placer County Water Agency

Truckee Donner Public Utility District

Northstar Community Services District

PCWA

TRUCKEE DONNER PUBLIC UTILITY DISTRICT

Martis Valley Groundwater Management Plan

Prepared for

Truckee Donner Public Utility District, Truckee, California

Placer County Water Agency, Auburn, California

Northstar Community Services District, Northstar, California

April 18, 2013

140691

MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN
NEVADA AND PLACER COUNTIES, CALIFORNIA

SIGNATURE PAGE

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List of Abbreviations

AB 3030	Assembly Bill 3030
ac-ft/yr	acre-feet per year
BMOs	Basin Management Objectives
CASGEM	California
cfs	cubic feet per second
CWC	California Water Code
DPH	Department of Public Health
DRI	Desert Research Institute
DWR	Department of Water Resources
DWSAP	Drinking Water Source Assessment Program
GAMA	Groundwater Ambient Monitoring and Assessment
GCM	general circulation model
GMP	Groundwater Management Plan
gpm	gallons per minute
GSFLOW	Ground-water and Surface-water Flow Model
IRWMP	Integrated Regional Water Management Plan
LGA	Local Groundwater Assistance
LLNL	Lawrence Livermore National Laboratory
LRWQCB	Lahontan Regional Water Quality Control Board
LUST	leaking underground storage tank
MCL	Maximum Contaminant Level
mgd	million gallons per day
MODFLOW	Modular Three-Dimensional Finite-Difference Groundwater Flow Model
msl	mean sea level
MVGB	Martis Valley Groundwater Basin
NCSD	Northstar Community Services District
NOAA	National Oceanic and Atmospheric Association
PCWA	Placer County Water Agency
PRMS	Precipitation Runoff Modeling System
PUC	Public Utilities Commission
SB	Senate Bill
sq mi	square miles
SWG	Stakeholder Working Group
SWRCB	State Water Resources Control Board
TDPUD	Truckee Donner Public Utility District
TDS	Total Dissolved Solids
TROA	Truckee River Operating Agreement
T-TSA	Tahoe-Truckee Sanitation Agency
USACE	United States Army Corps of Engineers
USFS	United State Forest Service
USGS	United States Geologic Survey
UZF	Unsaturated Zone Flow

Section 1
Introduction

In 1992, the State Legislature enacted the California Groundwater Management Act through Assembly Bill 3030 (AB 3030) to encourage local public agencies to adopt plans to manage groundwater resources within their jurisdictions. Provisions were created in the California Water Code (CWC) Sections 10750 et.seq. to manage the safe production, quality, and proper storage of groundwater and AB 3030 codified voluntary components of a Groundwater Management Plan (GMP). In 2002, Senate Bill 1938 (SB 1938) was signed into law which amended the CWC with required components of a GMP for any public agency seeking State funds administered through the California Department of Water Resources (DWR) for groundwater projects. In 2003, DWR published *Bulletin 118 – Update 2003, California's Groundwater* which includes seven recommended components of a GMP.

This GMP includes the following components: the partner agencies' authority, physical setting including groundwater conditions, management goals and Basin Management Objectives (BMOs), and GMP implementation activities.

1.1 Purpose of the Groundwater Management Plan

The Truckee Donner Public Utility District (TDPUD), Northstar Community Services District (NCSD), and Placer County Water Agency (PCWA) have voluntarily partnered to develop the Martis Valley GMP, a collaborative planning tool that assists the partner agencies with efforts to ensure long term quality and availability of shared groundwater resources in the Martis Valley Groundwater Basin (MVGB). This GMP is a "living document" that includes an overall goal, BMOs, and implementation actions that will be periodically updated to reflect changes in groundwater management and progress in meeting its goal and objectives.

The purpose of the Martis Valley GMP is to improve the understanding and management of the groundwater resource in Martis Valley, while providing a framework for the partner agencies to align policy and implement effective and sustainable groundwater management programs.

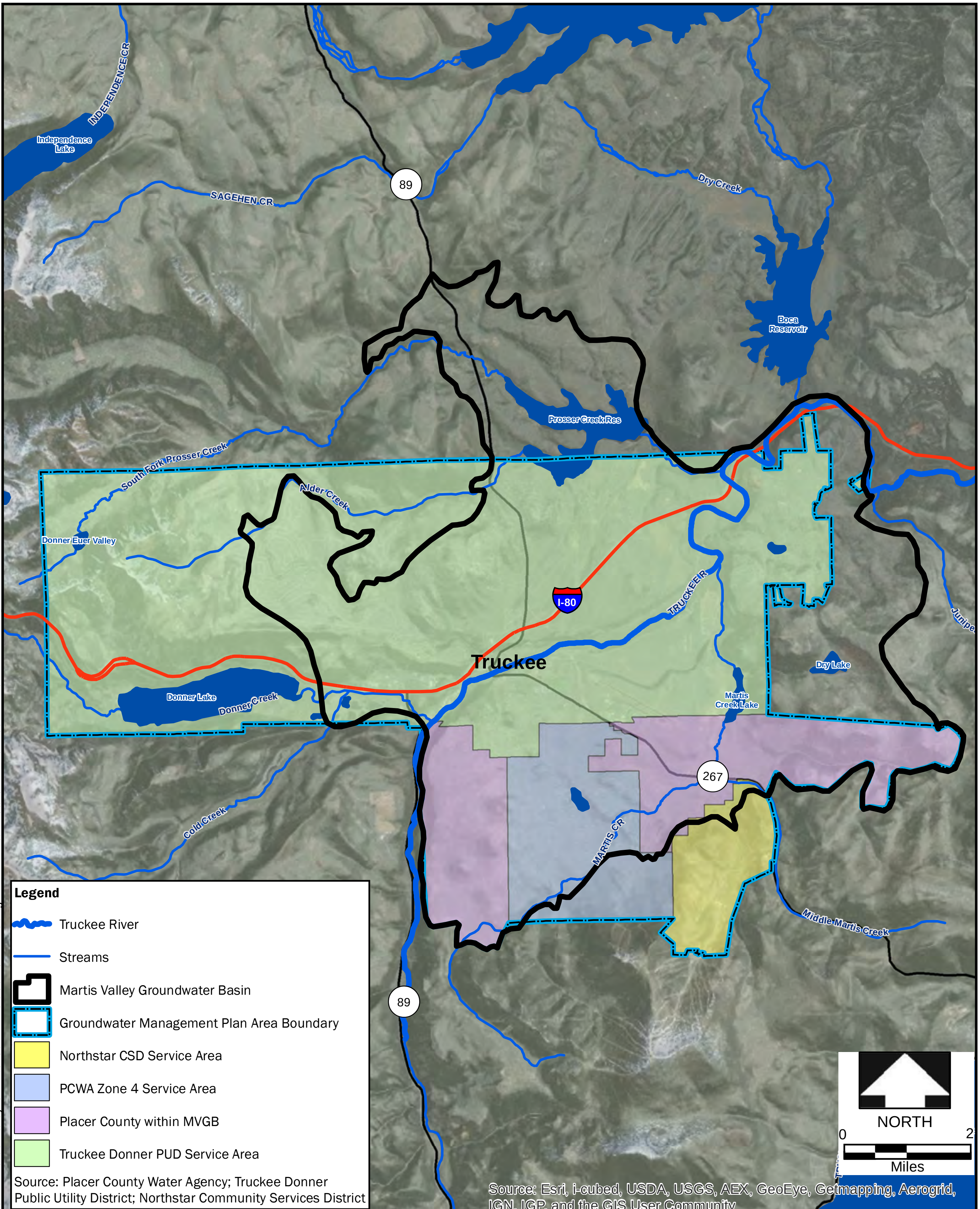
This GMP is not:

- mandatory,
- regulatory,
- an enforcement effort, or
- land use or zoning ordinances.

Older groundwater management plans by TDPUD (1995) and PCWA (1998) are herein updated by this GMP which has been designed to meet the requirements set by SB 1938, addresses the voluntary and recommended components included in AB 3030, as well as address recommendations outlined in Bulletin 118-2003. The area covered by the Martis Valley GMP, as shown in Figure 1-1, includes each partner agencies' jurisdictional boundaries within Nevada and Placer Counties.

1.2 Groundwater Management Plan Authority and Administration

Each partner agency is an authorized groundwater management agency within the meaning of CWC § 10753 (a). In April of 2011, each partner agency adopted respective resolutions of intent to develop a GMP; the resolutions are included as Appendix A.



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DATE 10/18/2012	PROJECT 140691	SITE **Martis Valley, California**	**Figure 1-1**
Brown AND Caldwell		TITLE **Groundwater Management Plan Area**	

1.3 Groundwater Management Plan Development Process

During the course of preparing the GMP, various entities were involved in developing, approving, and adopting the GMP. In addition to the partner agencies, a Stakeholder Working Group (SWG) was created to provide local knowledge, data and information, opinions, and review and comment on material prepared by the GMP team. The SWG was comprised of representatives of Federal, State, and local governments, environmental and special interest groups, and local land use interests. Four SWG meetings were held with the partner agencies during GMP development. SWG participants and the agency represented are presented in Table 1-1.

Table 1-1. Stakeholder Working Group Members

Working Group Participant	Representing
Chris Bonds	Department of Water Resources, Central Region Office
Steven Springhorn	Department of Water Resources, Central Region Office
Ron Parr	DMB Highlands Group LLC
Rick Stephens	Lahontan Community Association
John Eaton	Mountain Area Preservation Foundation
Kaitlin Backlund	Mountain Area Preservation Foundation
Michael Johnson	Placer County Community Development
Marcia Beals	Tahoe Truckee Sanitation Agency
Tony Lashbrook	Town of Truckee
Jeff Boyer	Truckee River Operating Agreement
Dave Wathen	Truckee River Operating Agreement
Lisa Wallace	Truckee River Watershed Council
Kenneth Parr	United States Bureau of Reclamation
Tom Scott	United States Bureau of Reclamation
Joanne Roubique	United States Forest Service, Truckee District
Andrew Strain	Heavenly Mountain Resort/Northstar California Resort
Adam Spear	Vail Resorts
Steve Maglisceau	Marlin Atlantis/Schaffer's Mill
Tony Firenzi	Placer County Water Agency
Steven Poncelet	Truckee Donner Public Utility District
Mike Staudenmayer	Northstar Community Services District

There are five main steps in the development of a GMP, as defined under CWC §10753.2 through 10753.6, and the agencies' actions to follow them are shown in Figure 1-2 and are summarized below:

Step 1 – Provide public notification of a hearing on whether or not to adopt a resolution of intention to draft a GMP and subsequently complete a hearing on whether or not to adopt a resolution of intention to draft a GMP. Following the hearing, draft a resolution of intention to draft a GMP. The agencies provided public notification and held their respective hearings in March 2011. Copies of newspaper notifications are included in Appendix A.

Step 2 – Adopt a resolution of intention to draft a GMP and publish the resolution of intention in accordance with public notification. The partner agencies' adopted their respective resolutions of intention to develop a GMP in April 2011. The resolutions are included as Appendix A.

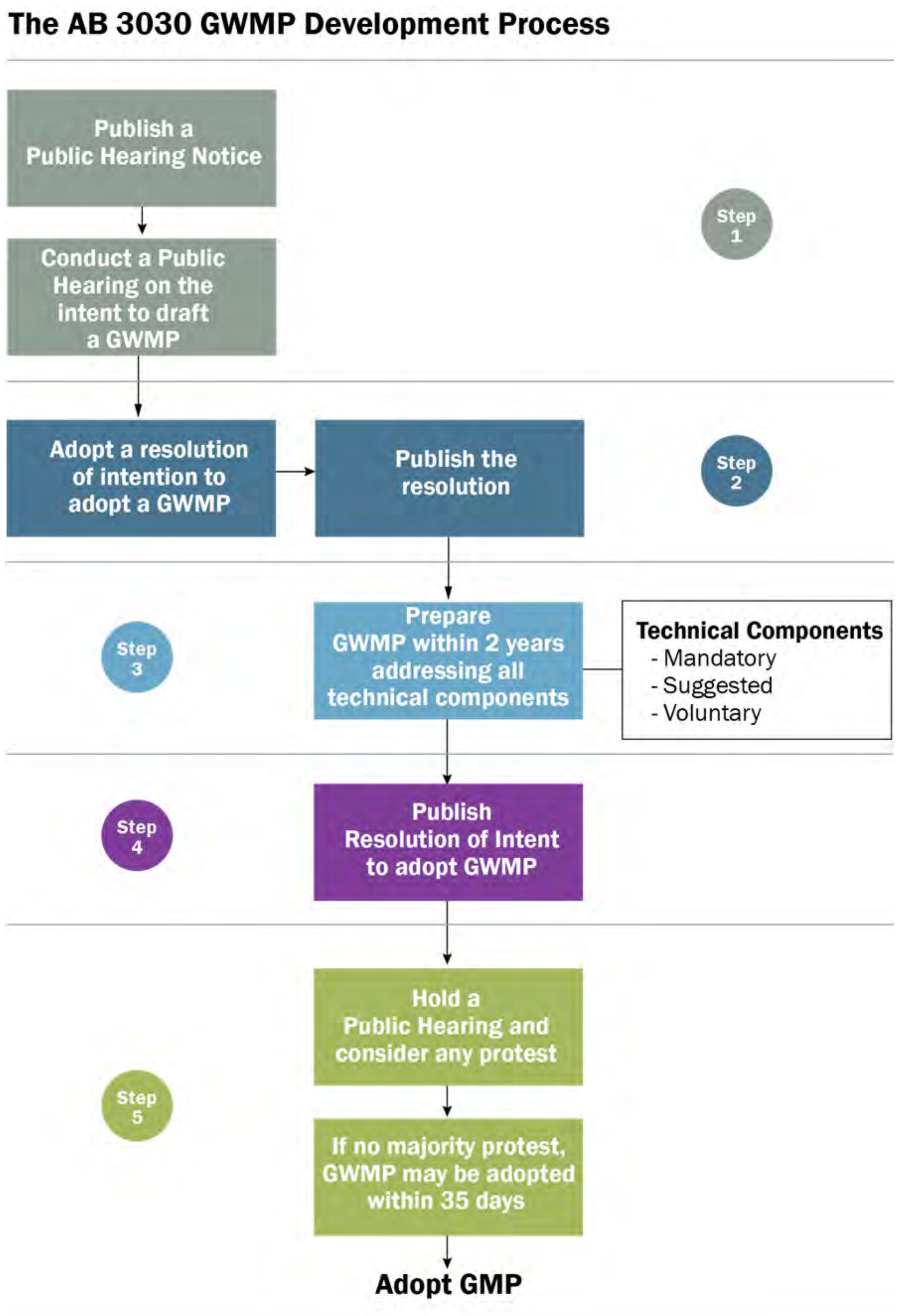


Figure 1-2. GMP Development Process

Step 3 – Prepare a draft GMP within two years of resolution of intention adoption. Provide to the public a written statement describing the manner in which interested parties may participate in developing the GMP. The agencies provided notification and held three SWG meetings where meeting attendees gave input on the GMP goal, BMOs, and implementation actions. The agencies also held a public meeting on July 20, 2011 to receive public input.

Step 4 – Provide public notification of a hearing on whether or not to adopt the GMP, followed by holding a hearing on whether or not to adopt the GMP. Public notices of the scheduled hearings were provided in the Auburn Journal and the Sierra Sun newspapers and proof of publications are included in Appendix B.

Step 5 – The plan may be adopted within 35 days after the completion of Step 4 above if protests are received for less than 50 percent of the assessed value of property in the plan area. If protests are received for greater than 50 percent of the assessed value of the property in the plan area, the plan will not be adopted. No public comments were received during the public comment period. In February 2013 each partner agency adopted the Martis Valley GMP and their respective resolutions are included in Appendix B.

1.4 Groundwater Management Goal

The GMP's goal provides the overarching purpose of the GMP, is used to identify the desired outcome of GMP implementation, is general in nature, and does not include quantitative components:

The goal of the Martis Valley GMP is to ensure long term quality and availability of groundwater in the Martis Valley Groundwater Basin.

1.5 Basin Management Objectives

The BMOs provide more specific direction to the GMP; they are generally protective of the groundwater resource and the environment, and each BMO identifies a distinct portion of the overarching goal which provides specific areas for focus. Summarized below are six primary areas that are emphasized and embodied in the BMO's that support the GMP goal:

1. Manage groundwater to maintain established and planned uses.

   Because the MVGB is the primary source of water to multiple users under separate jurisdictions, this objective encourages the partner agencies to pursue management of groundwater that is within their jurisdiction in order to protect existing uses.

2. Manage groundwater use within the provisions of the Truckee River Operating Agreement.

   The Truckee-Carson-Pyramid Lake Water Rights Settlement Act (Settlement Act), Public Law 101-618 (1990), established entitlements to the waters of Lake Tahoe, the Truckee River and its tributaries and how the storage reservoirs of the Truckee River are operated. Section 205 of the Settlement Act directs the Secretary of the Department of the Interior to negotiate an operating agreement for the operation of Truckee River reservoirs, between California, Nevada, Sierra Pacific Power Company, Pyramid Tribe, and the United States. The operating agreement is known as the Truckee River Operating Agreement (TROA).

   This objective documents the partner agencies' commitment to continue to comply with provisions of the TROA. Some provisions in TROA apply to groundwater and water wells within the Truckee River Basin (which includes the Martis Valley) to address potential adverse impacts to surface water.

3. **Collaborate and cooperate with groundwater users and stakeholders in the MVGB.**

   Collaborating and sharing information and resources with other groundwater users in the MVGB helps promote GMP goals. This objective encourages the partner agencies to reach out to other groundwater users within the MVGB.

4. **Protect groundwater quantity and quality.**

   Groundwater performs an integral function in a watershed, one of which is satisfying water supply needs. Improving the understanding of the groundwater basin is a critical step in protecting and sustaining the Martis Valley groundwater supply.

5. **Pursue and use the best available science and technology to inform the decision making process.**

   Science and technology continue to develop new tools that may improve the understanding of the MVGB. This objective encourages the partner agencies to take actions that work with the best available science to help make informed agency decisions.

6. **Consider the environment and participate in the stewardship of groundwater resources.**

   The partner agencies are dedicated to stewardship of groundwater resources and this BMO ensures that stewardship is part of the GMP.

1.6 Plan Components

Required GMP components and their location in the GMP are summarized in Table 1-2, Voluntary GMP components and their location in the GMP are summarized in Table 1-3, and recommended GMP components and their location in the GMP are summarized in Table 1-4.

Table 1-2. Required Components and Associated Report Section

Category Required	GMP Components Required Components: (10753.7.)	Report Section
1	Establish Basin Management Objectives (BMOs)	Section 1.5
2	Include components relating to the monitoring and management of: groundwater levels, groundwater quality, and inelastic land subsidence	Section 3.4
3	Include components relating to changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin	Section 3.2
4	Include description of how recharge areas identified in the GMP substantially contribute to the replenishment of the groundwater basin	Section 2.9
5	Prepare a GMP that enables the partner agencies to work cooperatively with other public entities whose service area falls within the plan area and overlies the groundwater basin	Section 3.1 Section 3.4
6	Prepare a map that details the area of the groundwater basin, the area subject to the GMP, and the boundaries of other local agencies that overlie the basin	Section 1.1
7	Prepare a map identifying the recharge areas for the groundwater basin	Section 2.9
8	Adopt monitoring protocols that detect changes in: groundwater levels, groundwater quality, inelastic land subsidence, and surface water flow or quality that affects groundwater or groundwater pumping that affects surface water flow or quality	Section 3.4
9	If the GMP area includes areas outside a groundwater basin as defined in Bulletin 118, the partner agencies will use the required components, and geologic and hydrologic principles appropriate for the area	Throughout GMP

Table 1-3. Voluntary Components and Associated Report Section		
Category Voluntary	GMP Components Voluntary Components (10753.8.)	Report Section
1	Control of saline intrusion	Section 3.1
2	Identification and management of wellhead protection	Section 3.4
3	Regulation of the migration of contaminated groundwater	Section 3.1 Section 3.2
4	Administration of a well abandonment and well destruction program	Section 3.1
5	Mitigation of conditions of overdraft	Section 3.1
6	Replenishment of groundwater extracted by water producers	Section 3.1
7	Monitoring of groundwater levels and storage	Section 3.4
8	Facilitating conjunctive use operations	Section 3.1
9	Identification of well construction policies	Section 3.4
10	Construction and operation by the partner agencies of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects	Section 3.1 Section 3.2
11	Development of relationships with state and Federal regulatory agencies	Section 3.1 Section 3.2 Section 3.5
12	Review of land use plans and coordination with land use planning agencies to assess activities that create a reasonable risk of groundwater contamination	Section 3.4

Table 1-4. Recommended Components and Associated Report Section		
Category Recommended	GMP Components Recommended Components (From Bulletin 118-2003 Appendix C)	Report Section
1	Document public involvement and ability of the public to participate in development of the GMP, this may include a Technical Advisory Committee (Stakeholder Working Group)	Section 1.3
2	Establish an advisory committee of stakeholders within the plan area that will help guide the development and implementation of the GMP and provide a forum for the resolution of controversial issues	Section 1.3 Section 3.1
3	Describe the area to be managed under the GMP including: • The physical structure of the aquifer system • A summary of available historical data and issues of concern related to groundwater levels, groundwater quality, inelastic land subsidence, and surface water flow or quality that effects groundwater or groundwater pumping that effects surface water flow or quality • A general discussion of historical and projected water demands and supplies	Section 2
4	Establish management objectives (MOs) for the groundwater basin subject to the GMP	Section 1.5
5	Describe the GMP's monitoring program	Section 3.4

Table 1-4. Recommended Components and Associated Report Section		
Category Recommended	GMP Components Recommended Components (From Bulletin 118-2003 Appendix C)	Report Section
6	Describe efforts to coordinate with land use, zoning, or water management planning agencies or activities	Section 3.4
7	Create a summary of monitoring locations with frequency of wells monitored	Appendix D
8	Provide periodic reports summarizing groundwater conditions and management activities including: • A summary of monitoring results, with a discussion of historical trends • A summary of management actions during the period covered by the report • A discussion of whether actions are achieving progress towards meeting BMOs • A summary of proposed management actions for the future • A summary of any GMP changes that occurred during the period covered by the report • A summary of actions taken to coordinate with other water and land agencies and other government agencies	Section 3.1
9	Provide for the periodic re-evaluation of the entire plan by the managing entity	Section 3.1

1.7 Area Covered by the GMP

The Martis Valley GMP includes the service areas of the TDPUD, PCWA, and NCSD that overlay and extend beyond the MVGB boundary, as well as the Placer County portion of the MVGB. It is important to note that at the time of GMP development, there were no other agencies within the Placer County portion of the MVGB that fall within the service area of another local agency, water corporation regulated by the Public Utility Commission (PUC), or mutual water company without the agreement of the overlying agency, as defined in the CWC (CWC § 10750.7(a)). Figure 1-1 shows the Martis Valley GMP area.

1.8 Public Outreach and Education

The partner agencies developed a Public Outreach Plan to guide development of the GMP. Public outreach included the formation of a Stakeholder Working Group to provide input on GMP development, two informative public meetings, and publically noticed public hearings (Appendix A) on the intent to draft and adopt the GMP. The Public Outreach Plan is included in Appendix C.

1.9 Groundwater Model

The partner agencies are currently collaborating with the Bureau of Reclamation (Reclamation) and their subcontractor, Desert Research Institute (DRI), to develop an integrated watershed-groundwater model in conjunction with the Martis Valley GMP. The geologic investigation conducted and documented in Section 2 of this report has been used to develop a geologic framework database, which was used to guide the conceptual and numerical model components for the hydrogeology components (groundwater model) of the integrated watershed model. The integrated watershed model is under development in parallel with the GMP and is not completed at the time of the issuance of the final GMP.

The integrated watershed model is comprised of a Precipitation Runoff Modeling System (PRMS) and Modular Three-Dimensional Finite-Difference Groundwater Flow Model (MODFLOW) coupled together using an Unsaturated Zone Flow (UZF) package. PRMS is used to model surface water within the watershed, whereas MODFLOW is used to model groundwater within the MVGB. The UZF model package is a kinematic wave vadose zone model used to simulate the interaction between surface water and groundwater. Each model will be calibrated separately, and then calibrated together over a ten year period using a coupled ground-water and surface-water Flow Model (GSFLOW). Predictive model simulations will be performed using multiple general circulation model (GCM) projections of precipitation and temperature to estimate the influence of future climate on water resources within the MVGB. Calibration targets for fully coupled, GSFLOW model will include head values measured from wells, meadow and spring locations, streamflows, measured snow depth, and remotely sensed snow cover.

The integrated model's model domain will cover the entire Martis Valley Watershed, which includes the MVGB, as well as the watersheds that contribute surface water to the region, including Lake Tahoe. The model grid's cells are 300 meters by 300 meters in size. To date, DRI has used the PRMS component of the integrated modeling tool to estimate groundwater recharge across the MVGB, and is discussed in more detail in Section 2.9.

1.10 Document Organization

The Martis Valley GMP is organized into the following sections:

- Section 2 Physical Setting: describes the physical setting of Martis Valley including items such as geologic setting, land use, water sources, and well infrastructure
- Section 3 Plan Implementation: discusses the implementation actions included in the Martis Valley GMP
- Section 4 References
- Appendices

Section 2

Physical Setting

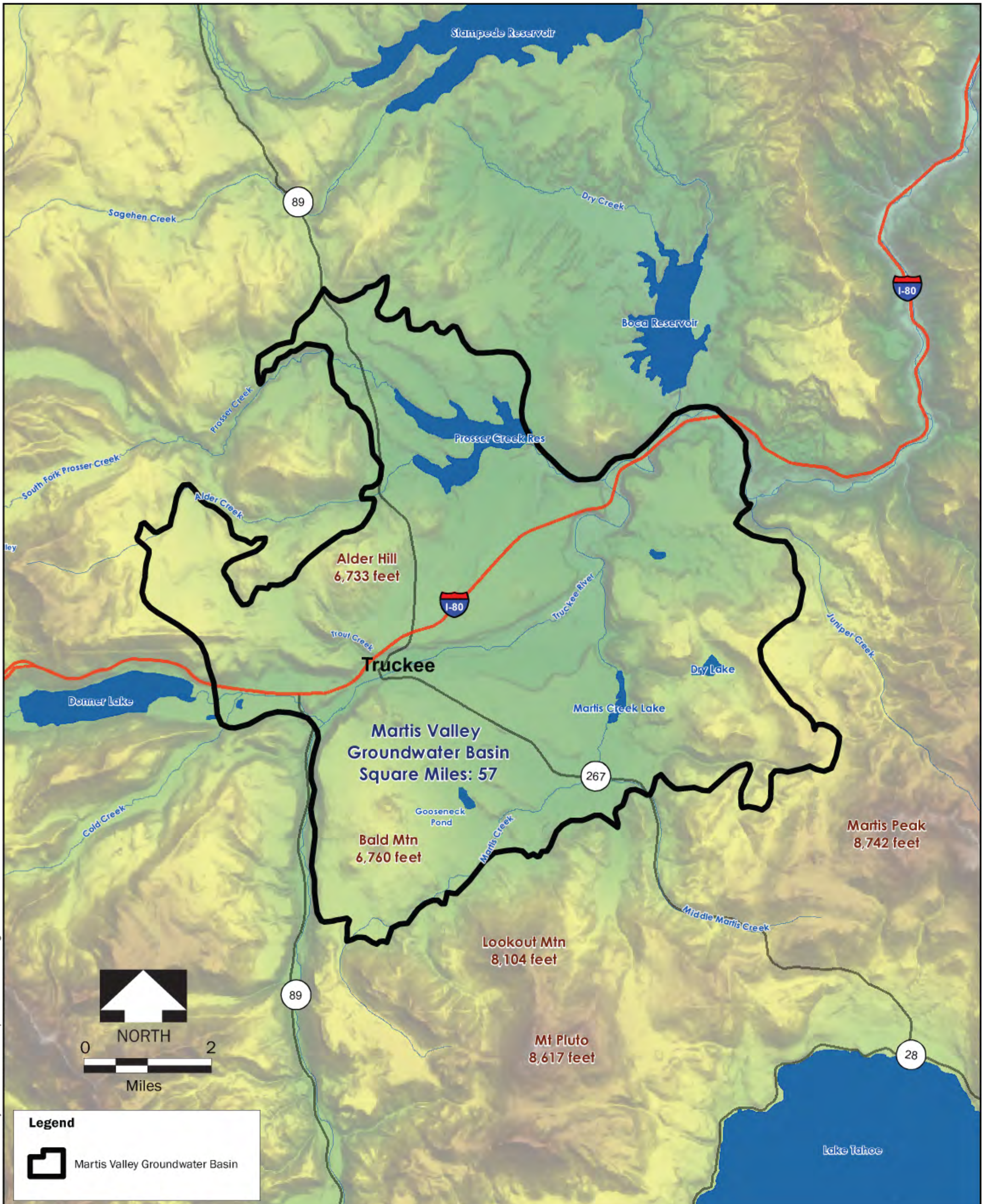
The MVGB is located in the transition zone between the Sierra Nevada and the Basin and Range Geomorphic Provinces, east of the Sierra Nevada crest and part of the larger Tahoe-Truckee River Basin of California and Nevada. Martis Valley is the principal topographic feature within the MVGB. The surrounding landscape is mountainous, underlain by volcanic and, to some extent, granitic bedrock, with apparent faulting and some portions that have been glaciated. A significant portion of the land within the MVGB boundary is privately owned with some areas managed as forest, open space and/or for recreation by special districts or agencies, including the U.S. Forest Service. This section of the GMP characterizes the physical setting of the MVGB, including: topography, climate, surface water hydrology, geology, hydrogeology, and water use.

2.1 Topography

The MVGB encompasses roughly 57 square miles, and lies within the Middle Truckee River Watershed. Elevations of the valley floor range from 5,700 to 5,900 feet above mean sea level (msl). The valley is accented by hills rising above the valley floor and mountains to the south and east of the valley. High points within or immediately adjacent to the MVGB include Bald Mountain at an elevation of 6,760 feet and Alder Hill at 6,733 feet, located on the western margin of the MVGB, and Lookout Mountain at 8,104 feet and Mt. Pluto at 8,617 feet, located on its the southern fringe. Martis Peak, further to the east, is at 8,742 feet. Figure 2-1 illustrates the MVGB location and topography.

2.2 Climate

The Tahoe-Truckee region experiences warm and dry summers, and cold, wet and snowy winters. Elevation and rain shadow play major roles in the spatial distribution of temperature and precipitation. Precipitation is highest at upper elevations in the western portion of the basin, toward the Sierra Crest, and decreases with elevation in the eastern portion of the basin (Figure 2-2). Mean annual precipitation (as snow water equivalent) ranges from approximately 30 inches below 6,500 feet to over 45 inches above 6,500 feet. Precipitation falls mostly as snow between October and April, though runoff and streamflow also responds to periodic mid-winter rain-on-snow events. Annual peak streamflow typically occurs during spring snowmelt in May or June. A small proportion of the total annual precipitation falls during brief thunderstorms in the summer months. Average monthly precipitation is shown in Figure 2-3, as recorded at the United States Forest Service (USFS) Truckee Ranger Station, near the center of the watershed (California Data Exchange Center Station TKE). Average temperatures range from daily lows of 15ºF in December and January to daily highs of 82ºF in July, as recorded at SNOTEL Station Truckee #2.



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DATE	PROJECT	SITE	
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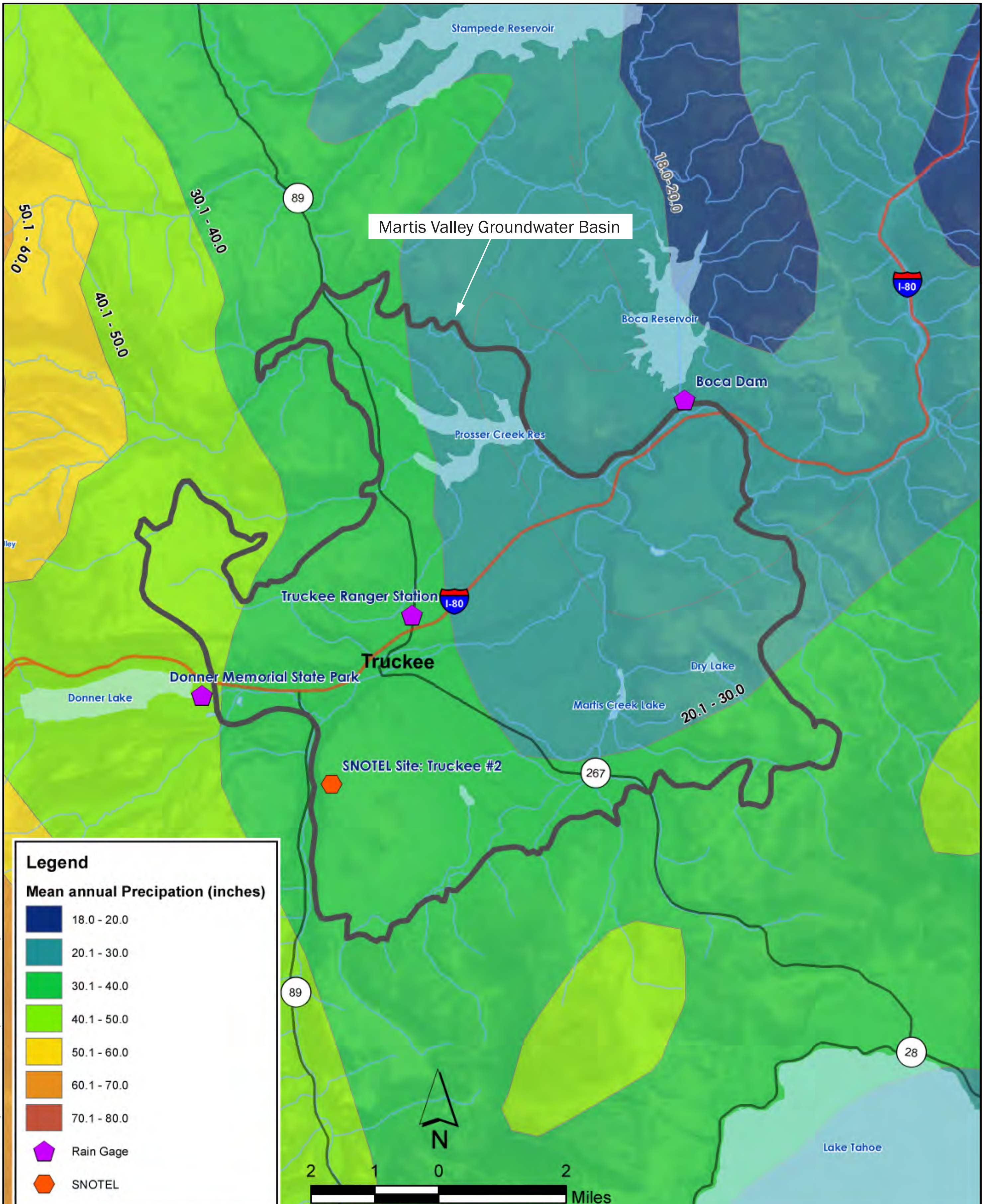
Brown AND Caldwell / Balance Hydrologics, Inc.		TITLE Groundwater Basin Location and Physiography	



DATE	PROJECT	SITE	
9-7-12	140691	Martis Valley Groundwater Basin, California	Figure 2-2
Brown AND Caldwell Balance Hydrologics, Inc.		TITLE Mean Annual Precipitation	

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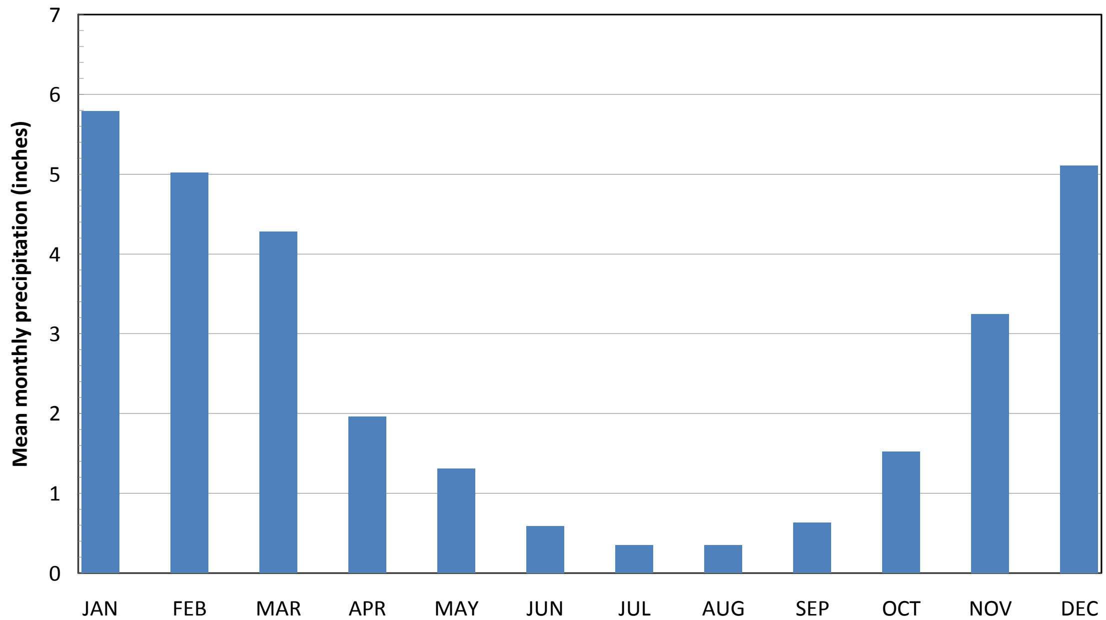

Figure 2-3. Mean Monthly Precipitation, Truckee Ranger Station, from 1904 to 1919 and 1935 to 2009

2.2.1 Climate Variability

The region experiences a wide range in climate variability. Variability is marked by periods of greater than average precipitation ('wet periods') and periods of below average precipitation or drought periods. Droughts have been historically common in the Sierra Nevada; Figure 2-4 illustrates the annual percent deviation from mean annual precipitation in Truckee and annual streamflow recorded at Farad from 1910 to 2009. The data shows that recent dry periods (periods of below average precipitation) generally have longer duration (e.g., 1971-1978, 1987-1994) than wet periods, which are typically short-lived and more extreme (e.g., 1962-1965, 1982-1983). The gray shading shows periods of incomplete annual precipitation data.

The worst drought in the 110 records of recorded streamflows at Farad was from 1987 to 1994. A similar pattern is recorded in tree-ring data since 1600 (Fritts and Gordon, 1980), with longer, more extreme droughts recorded. Lindstrom and others (2000) have described climate changes and details of wet and dry periods over the past 10,000 years, noting evidence of several dry periods when Lake Tahoe, and Donner and Independence Lakes dropped below their natural rims for consecutive years or decades (700 to 500 years ago and 200 to 100 years ago).

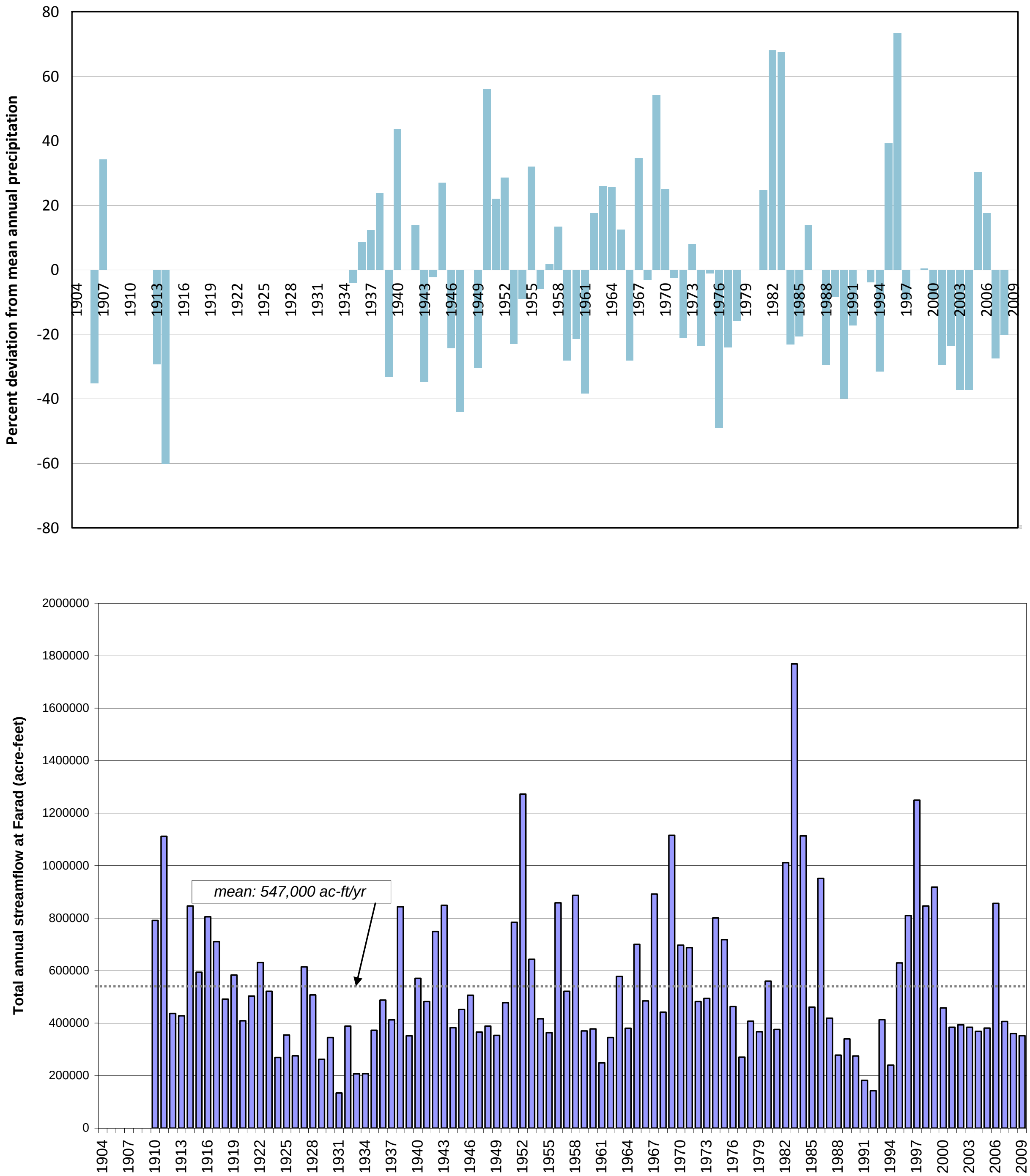

Figure 2-4. Percent Deviation from Mean Annual Precipitation at the Truckee Ranger Station and Total Annual Streamflow at Farad

2.2.2 Climate Change

The National Oceanic and Atmospheric Association (NOAA) and Coats and others (2010) have predicted a future shift from snowfall to rain in the next century in this region as a result of projected increases in average, minimum, and maximum air temperatures. Associated changes in surface water hydrology include potential increases in the frequency and magnitude of major flooding, such that more water may leave the basin as runoff, rather than infiltrating and recharging groundwater resources. NOAA has also predicted that climate change may result in increased drought frequency, and generally reduced water supplies (U.S. Bureau of Reclamation, 2011).

The U.S. Bureau of Reclamation manages water supply in the Truckee River Basin, and is undertaking a number of studies to evaluate the degree to which water supply and demand may be impacted by future changes in climate. This includes the Truckee River Basin Study, as well as funding researchers at DRI to develop an integrated groundwater, surface water, and climate change model of the MVGB.

2.3 Surface Water Hydrology

The Truckee River bisects the MVGB, with several tributaries upstream, within, and downstream of the MVGB. This section provides a brief discussion of the flow regimes of the Truckee River and the primary tributaries within the MVGB. Watershed areas are based on data available from CalAtlas, but subwatersheds shown have been modified in places for consistency with other regional studies, including the Water Quality Assessment and Modeling of the California portion of the Truckee River Basin (McGraw and others, 2001), the Truckee River Water Quality Monitoring Plan (Nichols Engineers, 2008), and the Martis Watershed Assessment (Shaw and others, 2012).

2.3.1 Truckee River

The Middle Truckee River[1] flows out of Lake Tahoe at Tahoe City with a number of tributaries contributing streamflow upstream of Martis Valley, including Bear, Squaw, Deer, Pole, Silver, and Cabin Creeks. The Truckee River then enters the MVGB near the junction of State Highway 89 and Interstate 80, flows west to east across Martis Valley before exiting the basin near Boca, just upstream of its confluence with the Little Truckee River. Main tributaries within Martis Valley are Donner, Cold[2], Trout, Martis and Prosser Creeks (Figure 2-5). Below Boca, the Truckee River descends into the Truckee Canyon before flowing through Reno and Sparks, Nevada, and terminating at Pyramid Lake.

Streamflow from Lake Tahoe, Donner Lake, Martis Creek, and Prosser Creek is controlled by major dams or impoundments, with the timing of releases and streamflows guided by a number of court decrees, agreements, and regulations that govern the flow rate from California to Nevada. These streamflow rates are known as 'Floriston Rates' and measured at Farad, California just upstream of the State line. The Truckee River is currently operated according to the Truckee River and Reservoir Operations Model (Berris and others, 2001). The Truckee River falls under the jurisdiction of TROA, which is further discussed in Section 3.2.

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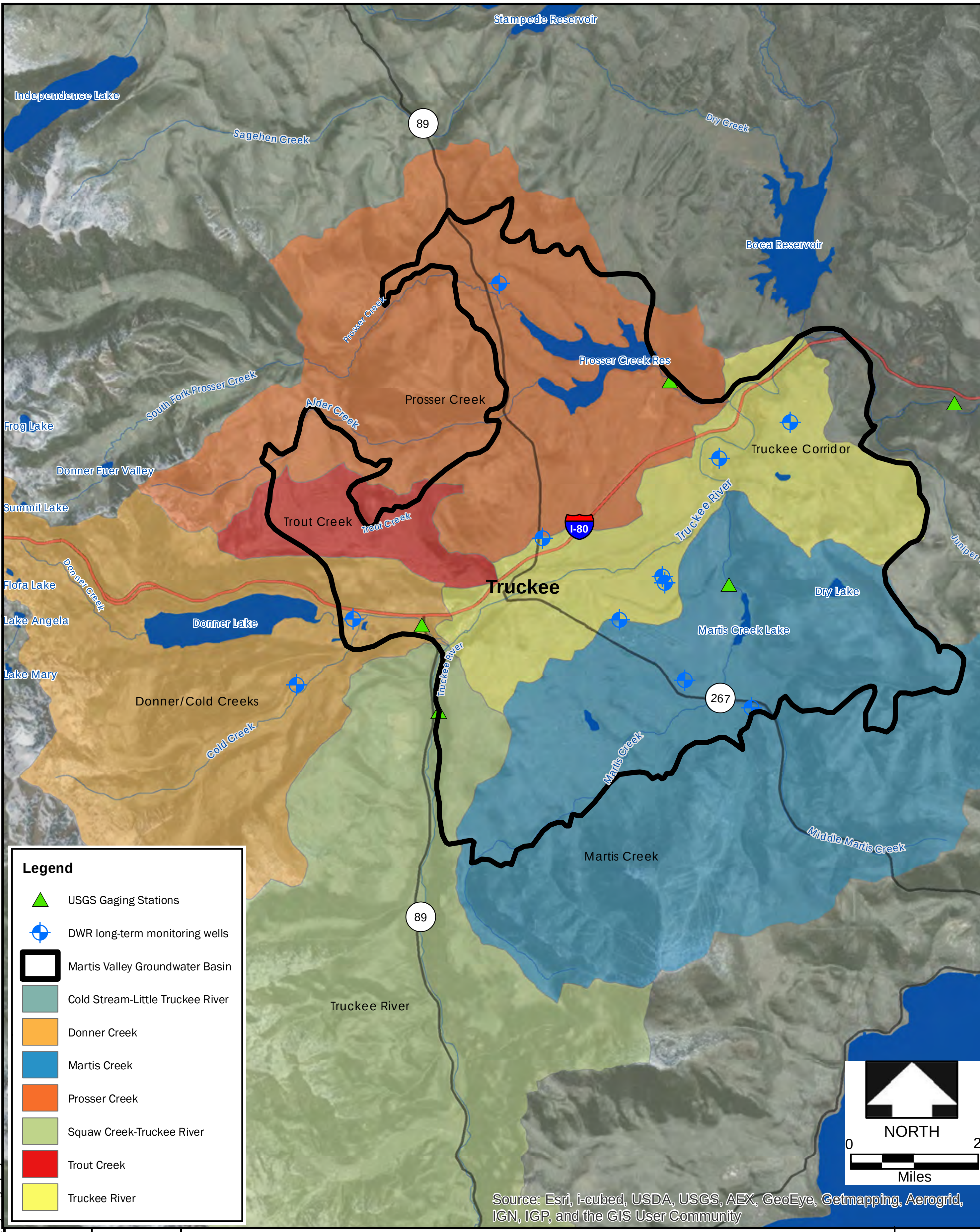
[1] Definitions of the Upper, Middle, and Lower Truckee River vary among numerous published studies. The definition used in this report of the "Middle Truckee River" definition used in this report conforms to nomenclature used by the California Lahontan Regional Water Quality Control Board, but differs from that used by the U.S. Bureau of Reclamation.

[2] Though it is not a direct tributary to the Truckee River, Cold Creek flows into Donner Creek below Donner Lake, approximately 1.5 miles upstream of the confluence with the Truckee River, and therefore accounts for a significant portion of the unregulated flow into the MVGB.



DATE	PROJECT	SITE	
11-2-2012	140691	**Martis Valley Groundwater Basin, California**	**Figure 2-5**
Brown AND Caldwell / Balance Hydrologics, Inc.		TITLE: **Hydrography and long-term monitoring stations**	

Martis Figure2_5_Hydrography.mxd

Table 2-1 summarizes historical monthly and average annual flow of the Truckee River and its tributaries, and Figure 2-6 correspondingly shows the average monthly streamflow at a number of gaging stations in the Truckee Basin. This data illustrates how the regulation of streamflows in the Truckee Basin alters the timing of discharge. Unregulated streams in this region tend to experience seasonal low flows in the late summer and early fall, with the bulk of total annual runoff occurring as snowmelt in May and June. This pattern is illustrated by monthly streamflow data collected at Sagehen Creek, an unregulated watershed approximately 5 miles north of the MVGB. In contrast, streams in the MVGB tend to have the total annual streamflow more uniformly distributed during the year, due to timed releases from the various impoundments.

Table 2-1. Average Monthly Streamflow on the Truckee River and Select Tributaries

	Sagehen Creek	Donner Creek below Donner Lake	Truckee River near Truckee	Prosser Creek below Prosser Dam	Martis Creek above Martis Dam	Truckee River at Boca	Truckee River at Farad
USGS Station ID	10343500	10338500	10338000	10340500		10344505	10346000
Watershed Size (sq mi)	10.5	14.3	553.0	52.9	37.2	873	932
Period of record	1953-present	1931-present	1945-present	1964-present	1959-1971; 1973-2007	2002-present	1910-present
(cfs)							
Oct	3	30	175	85	11	382	388
Nov	5	27	179	36	14	277	412
Dec	7	30	256	53	20	341	520
Jan	8	33	293	74	29	390	586
Feb	8	32	315	68	34	348	641
Mar	10	38	305	111	47	540	788
Apr	24	52	372	119	57	835	1240
May	43	86	532	190	52	1190	1680
Jun	25	45	457	112	26	900	1240
Jul	7	11	306	63	14	658	659
Aug	3	7	285	52	10	499	515
Sept	3	27	239	102	11	493	473
Mean annual (cfs)	12	35	310	89	27	571	762
Mean annual (ac-ft)	8,772	25,236	224,068	64,252	19,629	413,445	551,542

Source: U.S. Geological Survey; U.S. Army Corps of Engineers

cfs: cubic feet per second

ac-ft: acre-feet

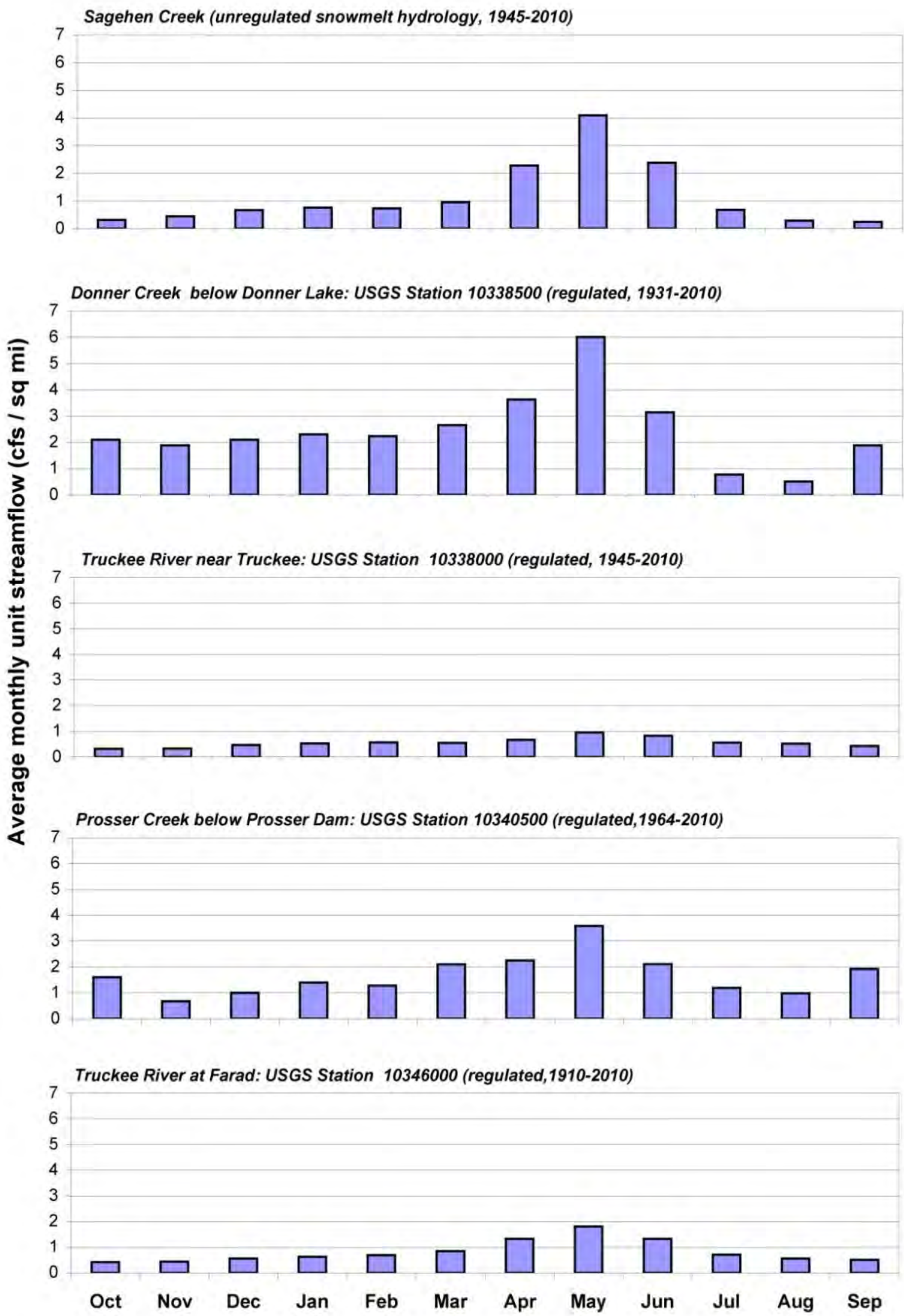


Figure 2-6. Mean Monthly Streamflows in the Middle Truckee River Watershed

2.3.2 Martis Creek

Martis Creek generally flows from south to north in the southern portion of the groundwater basin, with four named tributaries; Martis, West, Middle, and East Martis Creeks comprising the majority of its 42.7 square-mile watershed. Martis Creek Dam was completed in 1972 in order to provide storage for flood control, recreation, and potential water supply (USACE, 1985). Shortly following construction, seepage was observed in the dam face, posing a significant failure risk. As a result, the reservoir has rarely been filled to capacity, and is now maintained at a minimum pool elevation located entirely within the boundaries of the MVGB. The maximum outlet capacity of the dam is 580 cfs prior to spilling and 4,640 cfs at maximum spilling capacity. The United States Army Corps of Engineers (USACE) currently operates the dam in a ‘gates wide open’ position, such that minimal regulation or disruptions in the timing of streamflow occurs under most circumstances.

The United States Geologic Survey (USGS) maintained a streamflow gaging station on Martis Creek between Martis Dam and the Truckee River from October 1959 through September 2010, and recently transferred the gage to the USACE in October 2010. Since Martis Dam was constructed in 1972, this data has been used by the USACE, along with Martis Reservoir water level data and stage-storage information, to develop a record of inflow to Martis Reservoir. Daily reservoir inflow data is available for water years 1972 to 2008, and indicate average annual runoff into and out of the reservoir to be on the order of 19,629 acre-feet (27.1 cfs).

2.3.3 Donner and Cold Creeks

Donner Lake has a watershed area of approximately 14.3 square miles, all of which lies west of the MVGB boundary. The lake discharges into Donner Creek near the western boundary of the groundwater basin, and then flows toward the east and into the Truckee River (Figure 2-5). A dam was constructed at the lake outlet in 1928 (Berris and others, 2001) allowing for a reservoir capacity of 9,500 ac-ft. The Donner Lake dam is operated by the Nevada Energy (formerly Sierra Pacific Power Company), with a typical release season to provide flood control space from September 1 to November 15. The USGS has maintained a streamflow station on Donner Creek below Donner Lake (Station 10338500) since 1931. Average annual streamflow is 25,794 acre-feet (35.9 cfs), and Figure 2-6 illustrates the effect of dam operations on the timing of streamflow during the year.

2.3.3.1 Cold Creek

Cold Creek has a watershed area of approximately 12.5 square miles and flows from Coldstream Canyon into Donner Creek in the western portion of the groundwater basin. The confluence of these streams historically migrated across the Coldstream Canyon alluvial fan, but now both channels area confined by transportation infrastructure and historical aggregate mining operations. Cold Creek is the largest unregulated watershed that flows into the MVGB; with a runoff regime typical of a snowmelt-dominated system, with peak flows in May and June and low flows in the late summer and early fall.

A streamflow gage was installed on Cold Creek by Balance Hydrologics for the Truckee River Watershed Council in October, 2010. Cold Creek is the only significant tributary to Donner Creek between USGS gaging station 10338000 (Donner Creek at Donner Lake) and 10338700 (Donner Creek at Highway 89), therefore, historical streamflow estimates were inferred by calculating the difference in streamflow between these stations. Based on these data, average annual streamflow from Cold Creek is approximately 26,731 ac-ft (36.9 cfs).

2.3.4 Trout Creek

With a watershed area of approximately 5 square miles, Trout Creek is the only other unregulated stream (besides Cold Creek) which flows into the MVGB. The headwaters of Trout Creek are located within the Tahoe-Donner residential subdivision, part of the Town of Truckee and largely within the boundaries of the MVGB. The runoff regime is predominately snow-melt dominated, but with portions of the watershed covered with impervious surfaces such as roads and rooftops, rainfall events result in slightly more runoff and less infiltration and recharge from this watershed compared to others. A streamflow gage on Trout Creek was installed in January 2011 for the Truckee River Watershed Council so long-term streamflow statistics are not available.

2.3.5 Prosser Creek

Prosser Creek's approximately 32 square-mile watershed area includes Alder Creek and lies largely outside the MVGB. Prosser Creek Reservoir however, is entirely within the groundwater basin and is operated by the U.S. Bureau of Reclamation for water supply and flood control. Reservoir releases for flood control typically occur between September 1 and October 31 (Berris and others, 2001), as reflected in the pattern of average monthly flows depicted in Figure 2-6.

2.3.6 Truckee Corridor

The Truckee Corridor includes intervening areas that do not drain to the tributaries mentioned above. This includes the Union Creek subwatershed, which encompasses much of the Glenshire subdivision in the eastern portion of the MVGB, as well as urban and open space areas within the Town of Truckee.

2.3.7 Other impoundments

A number of small impoundments are located within the boundaries of the MVGB, including Union Mills Pond in the Glenshire subdivision, Dry Lake adjacent to the Waddle Ranch Preserve, and Gooseneck Reservoir, near the Lahontan Golf Club. Though originally constructed for cattle-grazing and/or millpond operations, these impoundments are now managed primarily for open space, recreational/aesthetic, or wildlife purposes.

2.4 Geology

The Martis Valley is located in the Sierra Nevada physiographic region, which is composed primarily of igneous and metamorphic rocks, with sedimentary rocks in its valleys. The MVGB's complex geology is dominated by sedimentary deposits left by glaciations, volcanic rocks, and faulting. A component of the Martis GMP was the development of geologic cross-sections to improve the understanding of MVGB geology and stratigraphy.

2.4.1 Geologic Database Development

Approximately 200 well logs obtained from the DWR, TDPUD, PCWA, NCSD, and the Tahoe-Truckee Sanitation Agency (T-TSA) were interpreted to better understand depths and thicknesses of the various geologic formations comprising the MVGB. The filtered geologic and selected well data were entered into an ESRI ArcGIS Geodatabase, a spatially-referenced database. The benefit of the Geodatabase allowed a visual representation of the geologic data and was also used as the geologic framework for the DRI groundwater model that provides consistency between the GMP geologic interpretation and the groundwater model.

The geochronology and stratigraphic relationships of water-bearing formations was based on Birkeland's (1961; 1963; 1964) work, as well as subsequent investigations by Latham (1985), and Hydro-Search (1995), and mapping published by Saucedo (2005) and Melody (2009). The stratigraphic relationships, lithologies, and formation locations described in these studies, as well as through field observations, formed the basis for the designation of the primary hydrostratigraphic units, as displayed in Figure 2-7. Figure 2-8 shows the approximate locations of wells used to develop the geologic database.

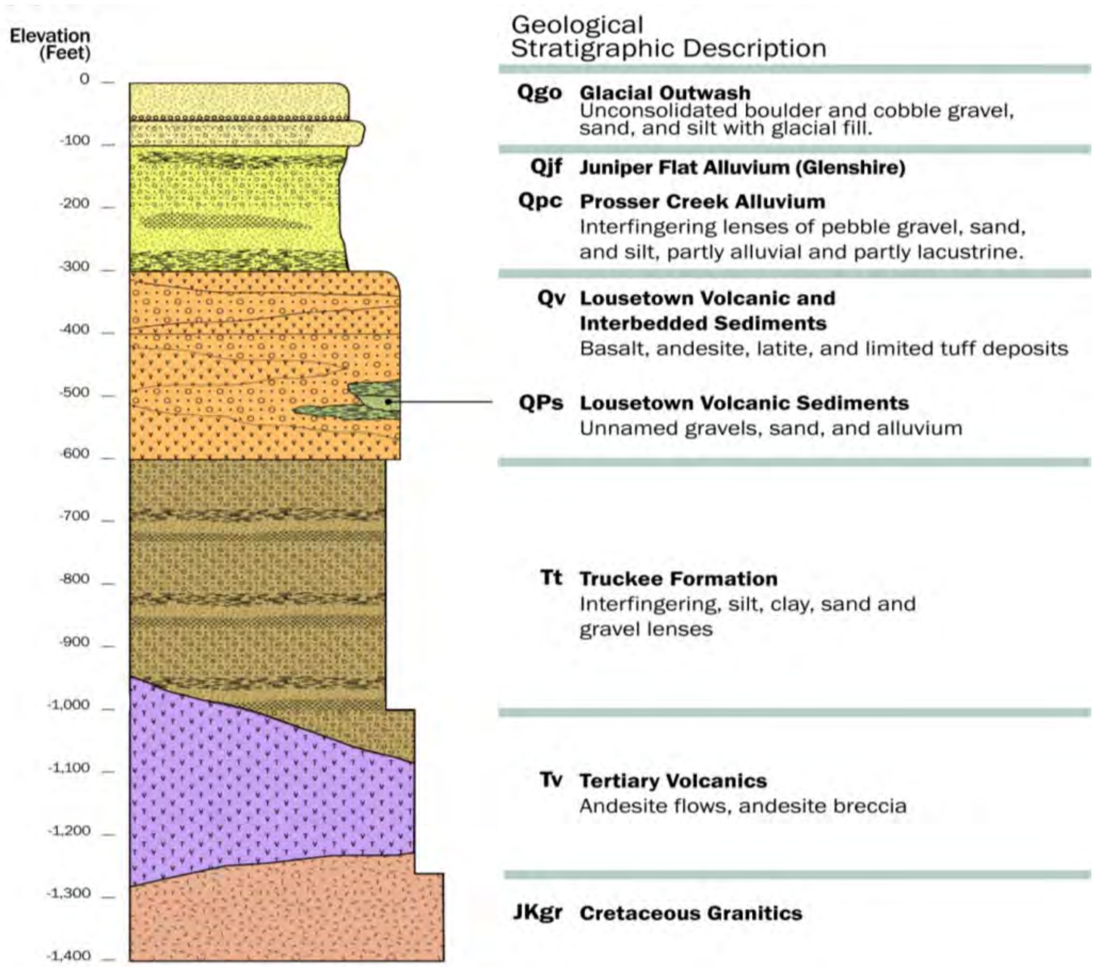
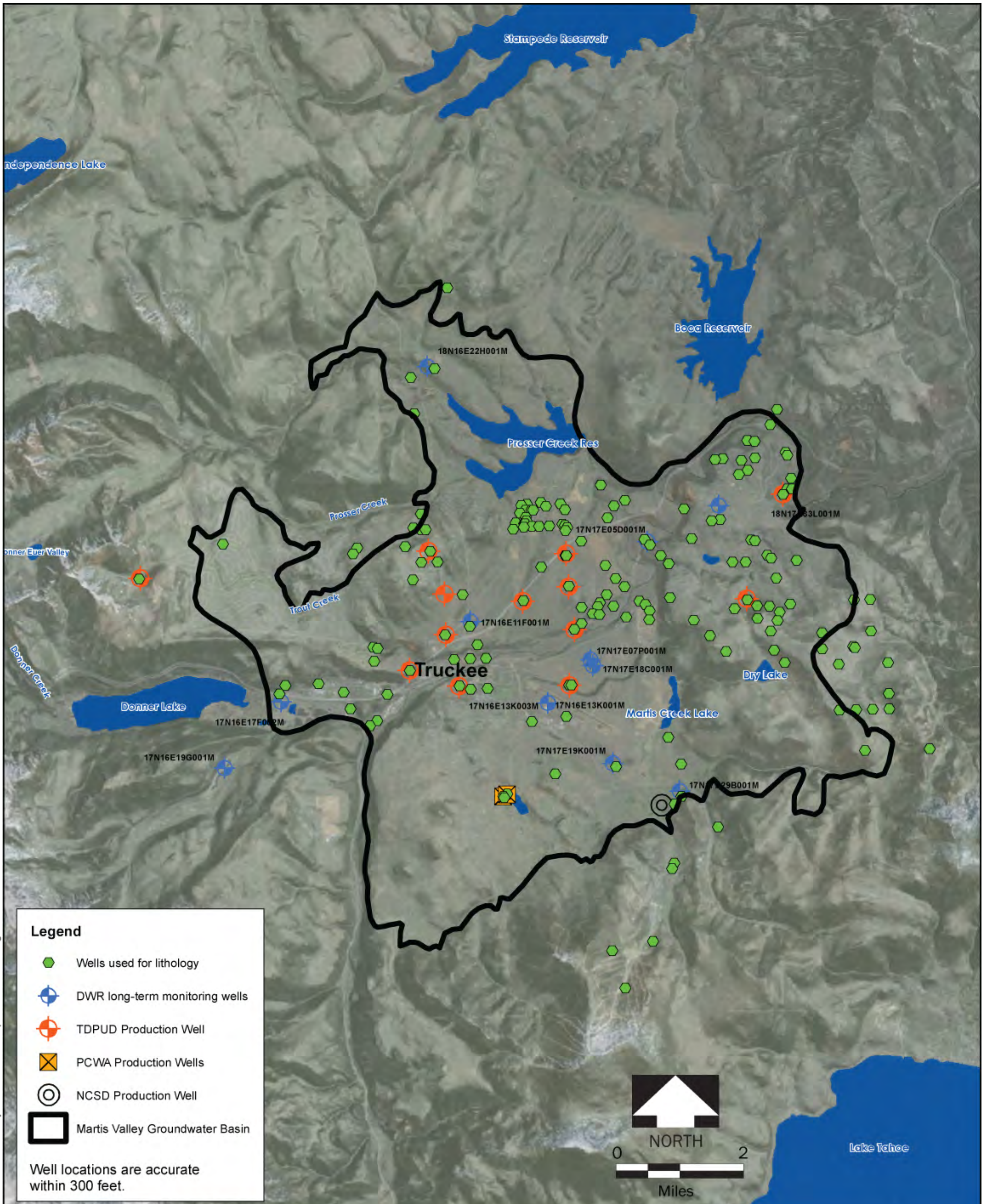


Figure 2-7. Stratigraphic Column showing Primary Hydrostratigraphic Units

Stratigraphic interpretations shown in Figure 2-7 and in Section 2.4.3 (below) are consistent with published geologic maps of the basin (Birkeland, 1961; Birkeland, 1963; Saucedo, 2005; Melody, 2009), and delineate four primary water-bearing stratigraphic units that make up the aquifer, and underlying rocks that are considered to be relatively water-limited (see Figure 2-9). The primary units shown in Figure 2-7 include a number of subunits mapped by previous investigators and shown on Figure 2-9 and noted in parenthesis with the descriptions below. When available, information regarding potentially confining (fine grained) or water-bearing (coarse) subunits are also delineated. Following well log interpretation, three representative geologic cross-sections were located and developed. Figure 2-9 shows the cross-section locations; Figure 2-10 shows cross-section A-A'; Figure 2-11 shows cross-section B-B', and Figure 2-12 shows cross-section C-C'.

It should be noted that Figure 2-9, a geologic map of the MVGB and surrounding areas, is based on published geologic mapping by Saucedo (2005), Melody (2009), and Saucedo and Wagner (1992). The Saucedo and Wagner (2009) mapping was completed at a statewide scale and is therefore, less precise than other portions of the map and geological cross-sections. Accordingly, portions of the geologic map in Figure 2-9 do not correspond to the more detailed geological mapping and cross-sections.



DATE	PROJECT	SITE	
9-7-12	140691	**Martis Valley Groundwater Basin, California**	**Figure 2-8**
Brown AND Caldwell; Balance Hydrologics, Inc.		TITLE: **Well Locations**	

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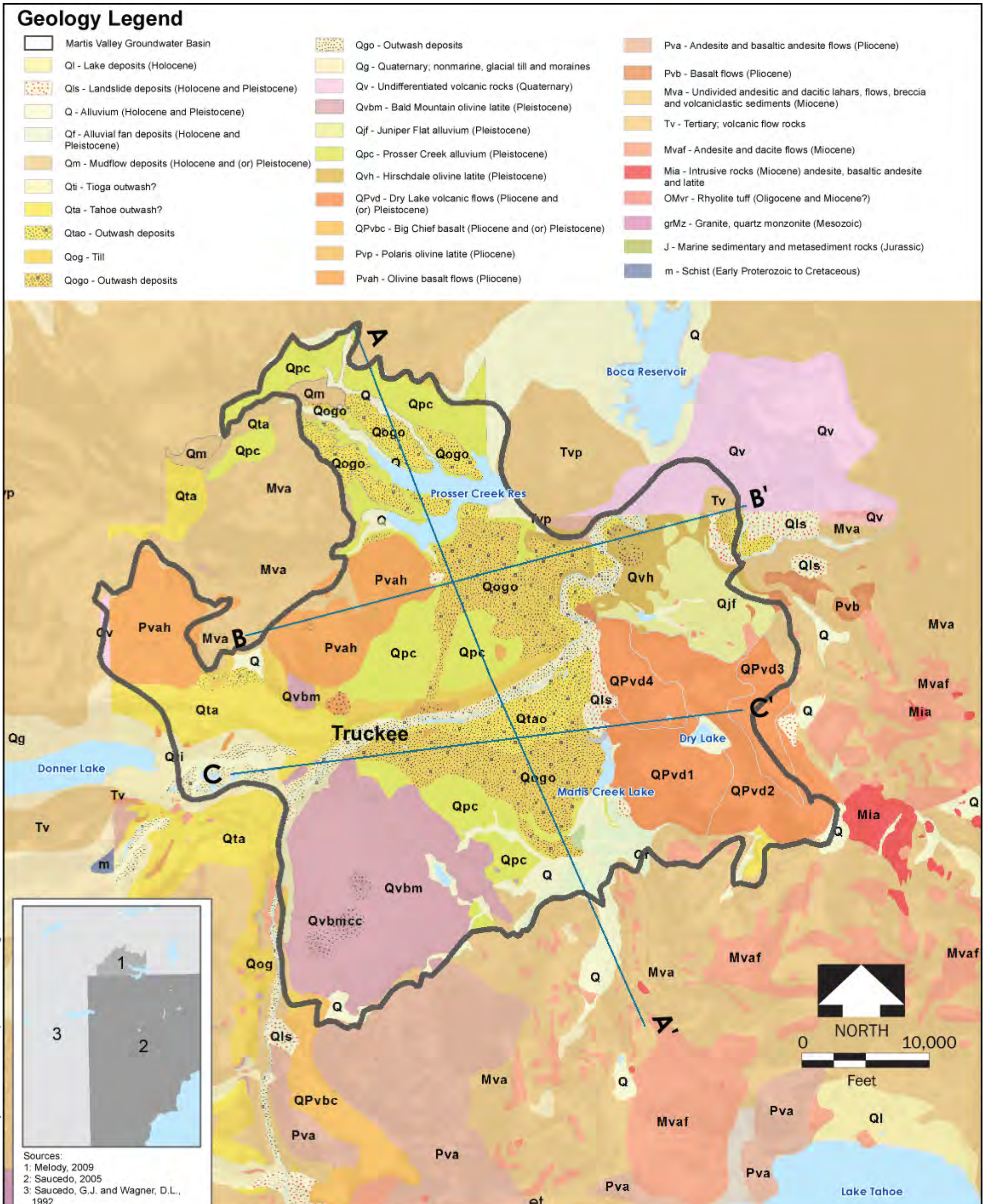

Sources:
1: Melody, 2009
2: Saucedo, 2005
3: Saucedo, G.J. and Wagner, D.L., 1992

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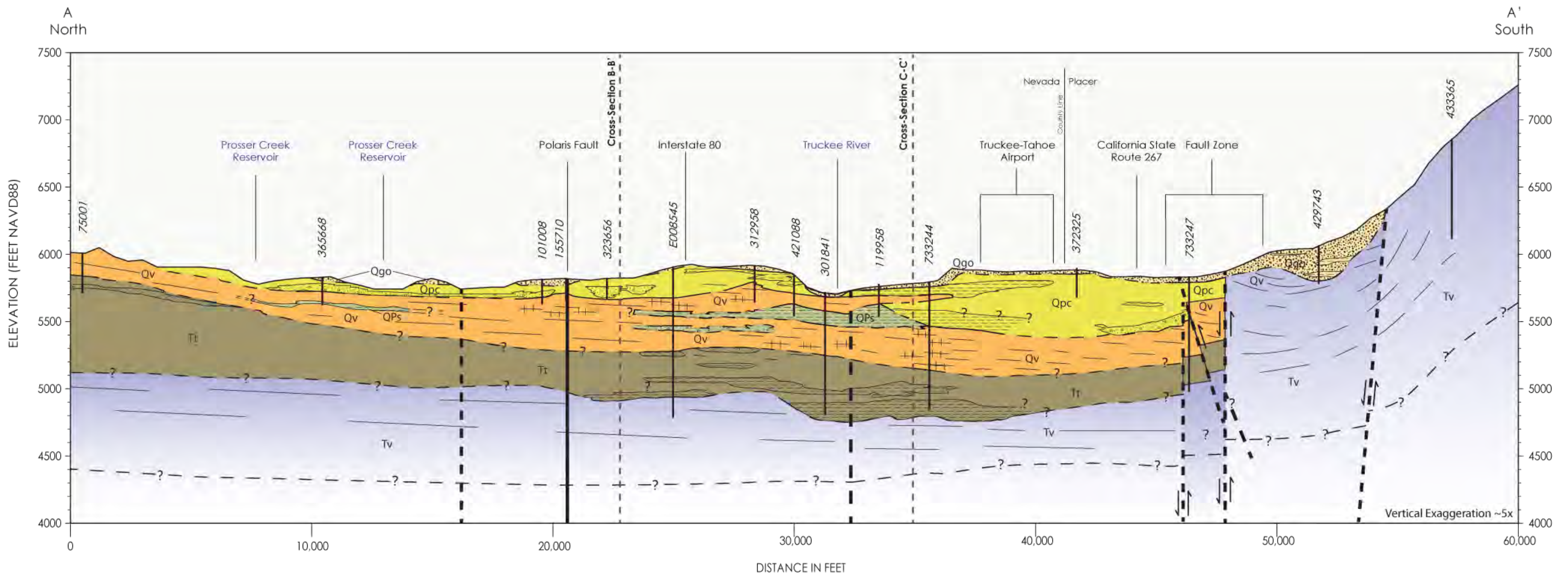
DATE	PROJECT	SITE
9-19-12	140691	Martis Valley Groundwater Basin, California
		TITLE
		Geology and Cross-section Locations

Brown AND Caldwell

Balance Hydrologics, Inc.

Figure 2-9



NOTES:

1. Approximate vertical exaggeration = 5x.
2. Elevation profile developed from 30-meter digital elevation model, downloaded from National Elevation Dataset (http://seamless.usgs.gov/index.php).
3. Well log locations are approximate within 600 feet.
4. Fault locations are approximate, based on Saucedo, "Geologic Map of Lake Tahoe Basin," 2005 and Hunter and others, 2011.
5. Surficial geology inferred from Saucedo, 2005.
6. Significant sand, gravel, and clay beds shown where noted in well logs.
7. Fracture zones shown where noted in well logs.

References:

Birkeland, P.W., 1963 Pleistocene History of the Truckee area, north of Lake Tahoe, California, Geological Society of America Bulletin, v. 64, p. 1453-1464.

Hunter, L.E., Howle, J.F., Rose, R.S., and Bawden, G.W., 2011, LiDAR – assisted identification of an active fault near Truckee, California, Bulletin of the Seismological Society of America, v. 101, n. 3, p. 1162-1181.

Latham, T.S., 1985, Stratigraphy, structure, and geochemistry of Plio-Pleistocene volcanic rocks of the western Basin and Range Province, near Truckee, California, unpublished doctoral dissertation, University of California, Davis, 341 p.

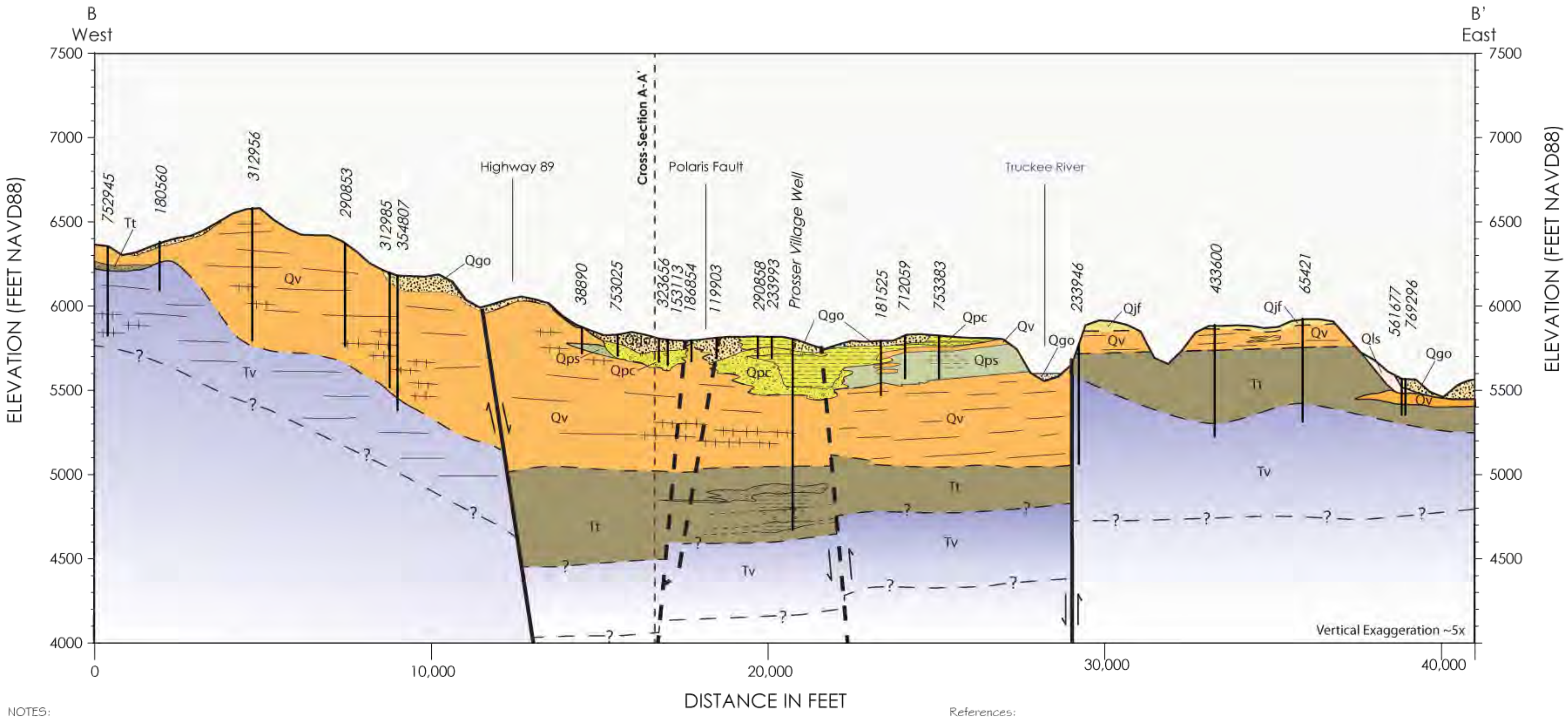
Melody, A., 2009, Active faulting and Quaternary paleohydrology of the Truckee Fault Zone north of Truckee, California, MS Thesis, Humboldt State University, Humboldt, CA 71 p.

Saucedo, G.J., 2005, Geologic Map of Lake Tahoe Basin, California and Nevada, California Geological Survey Regional Geologic Map Series, Map No. 4, 1:100,000 scale.

Legend

- Qg — Glacial Till/Moraine
- Qgo — Glacial Outwash deposits
- Qpc — Prosser Creek alluvium (Pleistocene)
- Qv — Lousetown Volcanics (Pleistocene)
- QPs — Lousetown Interbedded Sediments (Unnamed gravels, sand and alluvium) (Pliocene and (or) Pleistocene)
- Tt — Truckee Formation (Lake and Stream Deposits)
- Tv — Tertiary Volcanics
- Sands and Gravels
- Clay Bed
- Tuff/Ash
- Interbedded Basalt and Andesite Basalt
- Fracture Zone
- Lithologic Contact
- — ? — Inferred Lithologic Contact
- Fault, direction of displacement (dashed where inferred)
- 429743 Well log

SITE	Martis Valley Groundwater Basin, California
TITLE	Cross-section A-A'
Brown AND Caldwell / Balance Hydrologics, Inc.	DATE 9-7-12; PROJECT 140691
Figure 2-10	



NOTES:

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Hunter, L.E., Howle, J.F., Rose, R.S., and Bawden, G.W., 2011, LiDAR – assisted identification of an active fault near Truckee, California, Bulletin of the Seismological Society of America, v. 101, n. 3, p. 1162-1181.

Latham, T.S., 1985, Stratigraphy, structure, and geochemistry of Plio-Pleistocene volcanic rocks of the western Basin and Range Province, near Truckee, California, unpublished doctoral dissertation, University of California, Davis, 341 p.

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Saucedo, G.J., 2005, Geologic Map of Lake Tahoe Basin, California and Nevada, California Geological Survey Regional Geologic Map Series, Map No. 4, 1:100,000 scale.

Legend

- Qg — Glacial Till/Moraine
- Qgo — Glacial Outwash deposits
- Qls — Landslide deposits
- Qjf — Juniper Flat alluvium (Pleistocene)
- Qpc — Prosser Creek alluvium (Pleistocene)
- Qv — Lousetown Volcanics (Pleistocene)
- QPs — Lousetown Interbedded Sediments (Unnamed gravels, sand and alluvium) (Pliocene and (or) Pleistocene)
- Tt — Truckee Formation (Lake and Stream Deposits)
- Tv — Tertiary Volcanics
- Sands and Gravels
- Clay Bed
- Tuff/Ash
- Interbedded Basalt and Andesite Basalt
- Fracture Zone
- Lithologic Contact
- —?— Inferred Lithologic Contact
- Fault, direction of displacement (dashed where inferred)
- 429743 Well log

SITE
Martis Valley Groundwater Basin, California

TITLE
Cross-section B-B'

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Figure 2-11

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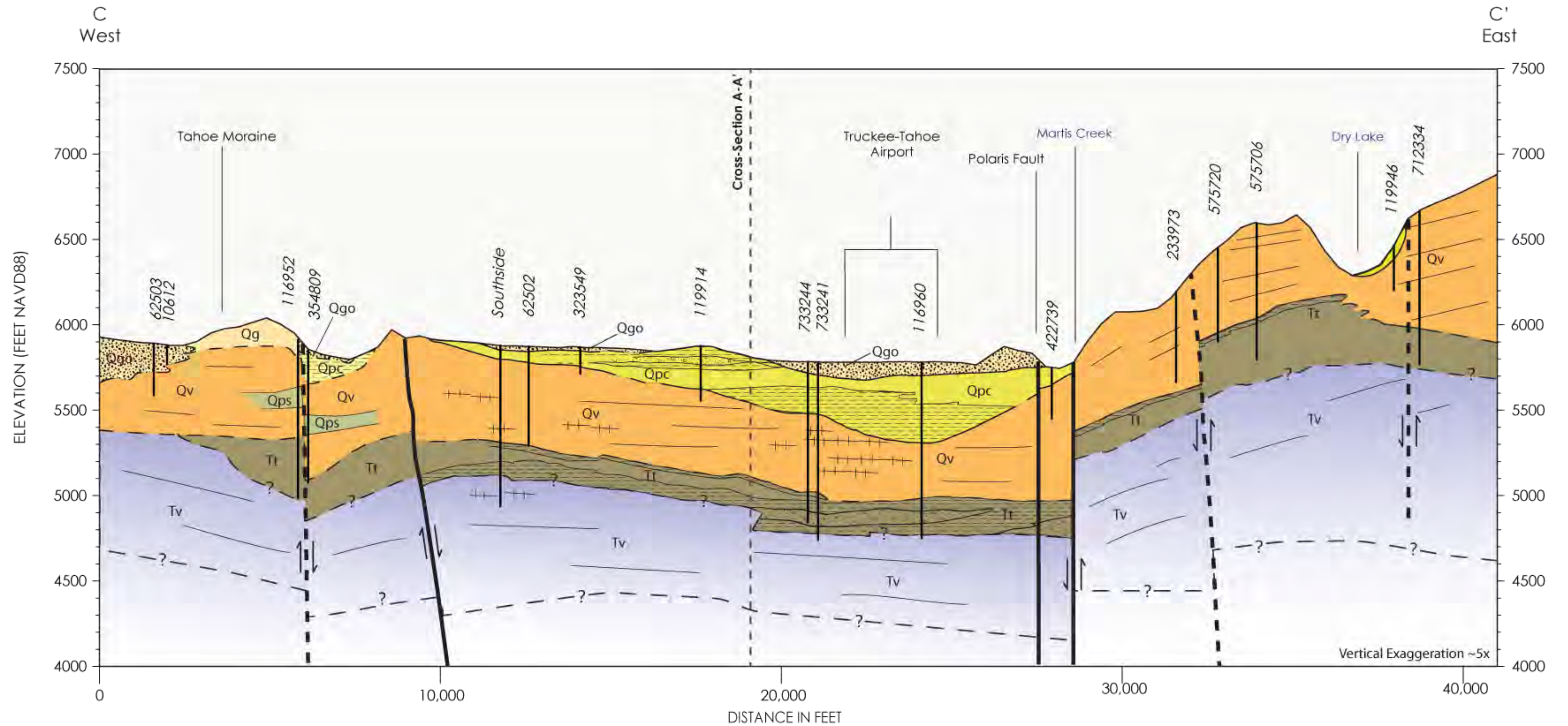

NOTES:

1. Approximate vertical exaggeration = 5x.
2. Elevation profile developed from 30-meter digital elevation model, downloaded from National Elevation Dataset (http://seamless.usgs.gov/index.php).
3. Well log locations are approximate within 600 feet.
4. Fault locations are approximate, based on Saucedo, "Geologic Map of Lake Tahoe Basin," 2005 and Hunter and others, 2011.
5. Surficial geology contacts inferred from Saucedo, 2005.
6. Significant sand, gravel, and clay beds shown where noted in well logs.
7. Fracture zones shown where noted in well logs.

References:

Birkeland, P.W., 1963 Pleistocene History of the Truckee area, north of Lake Tahoe, California, Geological Society of America Bulletin, v. 64, p. 1453-1464.

Hunter, L.E., Howle, J.F., Rose, R.S., and Bawden, G.W., 2011, LiDAR – assisted identification of an active fault near Truckee, California, Bulletin of the Seismological Society of America, v. 101, n. 3, p. 1162-1181.

Latham, T.S., 1985, Stratigraphy, structure, and geochemistry of Plio-Pleistocene volcanic rocks of the western Basin and Range Province, near Truckee, California, unpublished doctoral dissertation, University of California, Davis, 341 p.

Melody, A., 2009, Active faulting and Quaternary paleohydrology of the Truckee Fault Zone north of Truckee, California, MS Thesis, Humboldt State University, Humboldt, CA 71 p.

Saucedo, G.J., 2005, Geologic Map of Lake Tahoe Basin, California and Nevada, California Geological Survey Regional Geologic Map Series, Map No. 4, 1:100,000 scale.

Legend

- Qg — Glacial Till/Moraine
- Qgo — Glacial Outwash deposits
- Qpc — Prosser Creek alluvium (Pleistocene)
- Qv — Lousetown Volcanics (Pleistocene)
- QPs — Lousetown Interbedded Sediments (Unnamed gravels, sand and alluvium) (Pliocene and (or) Pleistocene)
- Tt — Truckee Formation (Lake and Stream Deposits)
- Tv — Tertiary Volcanics
- Sands and Gravels
- Clay Bed
- Tuff/Ash
- Interbedded Basalt and Andesite Basalt
- Fracture Zone
- Lithologic Contact
- ? — Inferred Lithologic Contact
- Fault, direction of displacement (dashed where inferred)
- 429743 — Well log

Source: ©2011 Balance Hydrologics, Inc.

SITE	Martis Valley Groundwater Basin, California
TITLE	Cross-section C-C'
DATE	9-7-12
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Figure 2-12

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2.4.2 Stratigraphy

The uplift along the faults that created the MVGB probably began during the late Pliocene and into the early Pleistocene, with relatively low-permeability Tertiary volcanics forming the bottom of the basin (considered basement rocks in this report). Prior to and throughout the middle Pliocene, the sedimentary material of the Truckee Formation was deposited in the MVGB, directly overlying andesite tuff breccias, andesite flows, and intrusive rocks of Tertiary age. Following deformation, the general topography of the Martis Valley was probably somewhat similar to today's topography (Birkeland, 1963), with the Truckee River flowing out of the MVGB near where it does today, cutting a canyon through the pre-Pleistocene rocks of the Carson Range.

During the Pleistocene, a series of volcanic flows occurred in the regional Truckee area. At least 20 distinct flows have been recognized (Birkeland, 1961), mostly (but not exclusively) consisting of fine-grained latites and basalts, and are noted as being fairly local in extent. Flows found in the MVGB include the Dry Lake Flows (QPvd), the Bald Mountain olivine latite (Qvbm), Alder Hill Basalt, Polaris olivine latite, and Hirschdale olivine latite. Collectively, these units are referred to as Lousetown volcanics (Qv) based on Birkeland's (1963) correlation to other Lousetown flows in the Carson Range. Also included within the in the Lousetown Formation are interbedded Lousetown sediments (Qps); fluvial (stream) and lacustrine (lake) deposits accumulating, and thereby raising land surface elevation, in the valley between flow events.

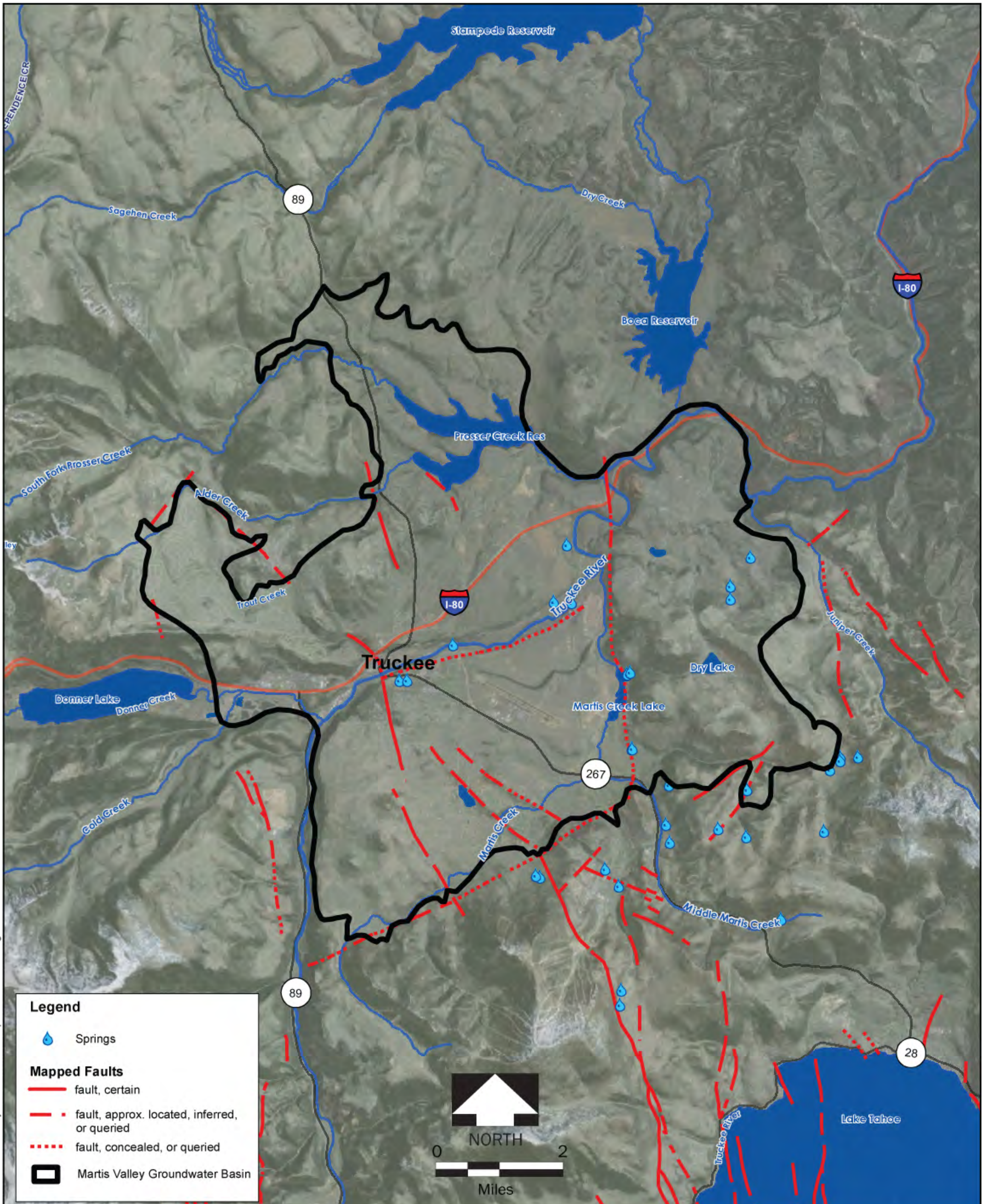
As volcanic activity waned, one of the last flows, the Hirschdale Olivine Latite, flowed across the Truckee River Canyon, damming the basin and causing widespread sediment accumulation and deposition of the Prosser Formation (Qpc), a partly-lacustrine and partly fluvial sedimentary unit (Birkeland, 1963). Brown (2010) has subdivided the Prosser Formation into Upper, Middle, and Lower Members. For geodatabase development purposes, interbedded Lousetown sediments are defined as being capped by volcanics, while the Prosser Formation is not. It is recognized however, that the lower Prosser Formation may have been deposited concurrently with the interbedded Lousetown sediments, and in some cases, may be correlated to these upper sediments where capping volcanics pinch out laterally.

During this same period, Juniper Flat alluvium was being deposited in the Glenshire area with sediment derived from the paleo-Juniper Creek watershed and alluvium derived from the west.

The Prosser Formation and volcanics in other areas are capped by glacial deposits, derived from glacial advances and retreats during a number of glacial episodes (Birkeland, 1961). In the MVGB, most of the deposits consist of glacial outwash deposits of varying age (Qgo). The outwash deposits consist of loose and unconsolidated boulder, cobble, gravel, and sand. In the vicinity of the Truckee River, three distinct outwash deposits (Qogo, Qtao, and Qti) are apparent and form terraces along the course of the river (Birkeland, 1961). A number of glacial moraines were also deposited, and are visible today in the vicinity of Donner Lake, the Tahoe-Donner residential neighborhood, and the Gateway Neighborhood of Truckee.

2.4.3 Structure

The MVGB lies within the Truckee Basin, a structural trough formed at the boundary of the Sierra Nevada and Basin and Range Geomorphic Provinces. Tectonics in this zone are complex and include active right-lateral (strike-slip) shear associated with the Pacific-North American Plate boundary and North Walker Lane Belt, as well as extensional (normal) faulting associated with the Basin and Range Province. The uplift along the faults that created the basin probably began during the late Pliocene and into the early Pleistocene (Birkeland, 1963), while right-lateral faulting is inferred to have occurred into the Holocene (Melody, 2009; Brown, 2010; Hunter and others, 2011). Most recently, the Polaris Fault has been mapped as an active North-South Holocene fault across the center of the MVGB. Identified faults are shown in Figure 2-13.



DATE	PROJECT	SITE	
9-7-12	140691	Martis Valley Groundwater Basin, California	Figure 2-13
Brown AND Caldwell / Balance Hydrologics, Inc.		TITLE: Locations of Springs and Mapped Faults (active and inferred)	

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2.5 Groundwater Occurrence and Movement

The geologic units described above are interlayered, with complex spatial relationships, and as such, the occurrence and movement of groundwater within and between these units is variable. For this report, the low-permeability Miocene (Tertiary) volcanic rocks are considered the bottom of the MVGB. This section discusses where groundwater occurs, groundwater and surface water interaction, and water levels over time.

2.5.1 Water-bearing Units and Properties

The Truckee Formation (Tt) is composed of interlayered silts, sands, and clays, and therefore has variable groundwater availability. Well driller's logs document sands and gravels within the Truckee Formation in the center of the basin, near the Truckee Tahoe Airport, at depths of approximately 900 to 1,000 feet, and from 200 to 700 feet in the southern portion of the basin near Shaffer's Mill and Lahontan Golf Clubs. Well yields in the Truckee Formation range from 280 gallons per minute (gpm) in the eastern portion of the basin (Hydro-Search, 1995) to more than 1,000 gpm in faulted areas underlying the Bald Mountain volcanics in the southwestern portions of the MVGB (Herzog, 2001).

Water is found along faults and fractures within the Lousetown volcanics (Qv), though portions of the volcanic flows are massive and unfractured. Figure 2-14a is a photo of a Lousetown volcanic outcrop and illustrates the range of fracture concentrations that can occur in this unit. In most cases, water encountered in this fractured system is pressurized, rising to a static level several hundred feet higher than where initially encountered, suggesting the presence of confining units above these fracture zones.

Wells located in the southern portion of the groundwater basin have been found to be artesian, or flowing, along fractures interpreted as faults (Herzog and Whitford, 2001), with yields ranging from approximately 250 to 1,000 gpm. A number of distinct fault blocks are present in this area, with unique and heterogeneous aquifer properties where faults serve as barriers to groundwater flow (ECO:LOGIC, 2006; ECO:LOGIC, 2007; Bugenig, 2007; Bugenig, 2006; Peck and Herzog, 2008). Groundwater discharge areas in the form of seeps and springs are also found within these areas and along the periphery of the MVGB (Figure 2-13), including thermal springs in the vicinity of the recently-mapped Polaris Fault (Hunter and others, 2011).

The Prosser Formation (Qpc) includes interlayered silts, sands, and clays and has variable water bearing capacity. Figure 2-14b shows an outcrop of the Prosser Formation, where coarser materials such as sand and gravel are present, and moderate groundwater yields may be encountered. Water-bearing portions of the Prosser Formation may also be hydrologically connected to overlying glacial outwash and potentially surface water bodies as well. Well yields in these alluvial formations typically range from 12 to 100 gpm, though larger-diameter production wells have estimated yields as high as 500 gpm according to State well driller's logs.

Hydraulic properties of the glacial moraines contrast sharply with those of the glacial outwash deposits; the moraines consist of poorly-sorted clay to boulder-size materials, while the glacial outwash deposits are primarily well-sorted sands and gravels. As a result, the glacial outwash tends to transmit water relatively easily, while moraines are typically water-limited.

Figure 2-14a. Lousetown Volcanic Outcrop

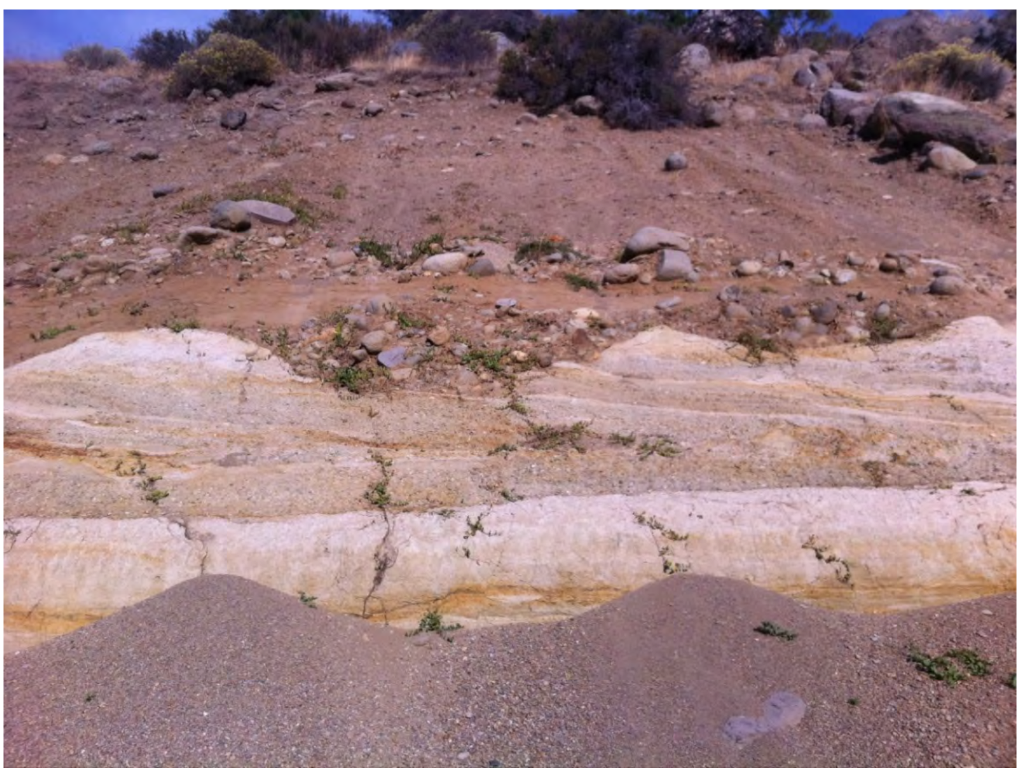


Figure 2-14b. Prosser Formation Outcrop Underlying Glacial Outwash

2.5.2 Surface-groundwater interaction

Generalized groundwater flow directions were inferred by Hydro-Search (1995) and were based on static water levels reported in State well drillers reports and DWR's long-term well monitoring data, and indicated groundwater flow directions toward the Truckee River.

A more detailed surface water and groundwater interaction study (Interflow Hydrology, 2003) was completed for the TDPUD. The Interflow Hydrology study provides estimates of the magnitude of stream losses and gains to and from groundwater across the Martis Valley during summer 2002, in the middle of a multi-year dry period. Observations made during the course of the study showed Martis Creek to be a 'gaining stream' (receiving groundwater discharge) across the Lahontan Golf Club, upstream of Martis Valley; West Martis Creek was found to be a 'losing stream' as it enters Martis Valley, recharging groundwater between the Northstar Golf Course and its confluence with Martis Creek; and Middle Martis Creek showed no loss or gain across the valley floor. Groundwater discharge in the form of springs generally support perennial flows in Lower East Martis and Dry Lake Creeks, as well as from the hillside adjacent to Martis Reservoir.

Interflow Hydrology (2003) computed a basic water balance based on late season low flow measurements in the watershed and found that in October 2002, total streamflow losses across the Martis Valley floor were on the order of 0.65 cfs (approximately 9 percent of the total baseflow into the MVGB from Martis Creek), while losses at Martis Creek Lake were on the order of 1.55 cfs (approximately 29 percent of the total flow at that point). Evaporation and evapotranspiration by plants were not measured as part of the study; however, these data suggest that the Martis Valley floor potentially serves as a groundwater recharge area during the late summer and fall months.

In addition, Interflow Hydrology (2003) identified groundwater recharge occurring where Prosser Creek enters the MVGB, just upstream of Prosser Reservoir. All other tributaries, including Cold, Donner, and Trout Creeks were concluded to be supported by groundwater discharge.

2.5.3 Groundwater levels and Land Subsidence

Groundwater levels have been generally stable in the Martis Valley with some declines occurring in specific regions. Figure 2-15 presents groundwater level monitoring data throughout much of the MVGB as measured by DWR since 1990 in a single set of hydrographs. This graph shows that overall groundwater levels have been stable in the MVGB, including during the drought of the early 1990s, and the wet years of the late 1990s.

Figure 2-16 shows the locations of the 16 DWR monitoring wells and selected respective hydrographs. The hydrographs indicate that groundwater is locally variable in the MVGB, as levels may decline in some wells and rise in other wells over the same period of time. These data suggest that there may be several water-bearing zones in the MVGB that may or not be hydraulically connected. The hydrographs also provides the following well specific information:

- Well 17N16E11F001M (northeast of downtown Truckee) experienced a nearly 50-foot rise in water level in the late 1990s, and then declined steadily over the following decade. This rise coincides with above-average precipitation and streamflow (Figure 2-4).
- Levels in Well 17N17E29B001M (Northstar) and 17N17E19K001M (Truckee Airport) were relatively steady throughout the monitoring period until summer 2007, when seasonal fluctuations began to occur. Water levels have declined seven feet between 2007 and 2012.
- Groundwater levels in well 17N17E05D001M (Truckee River east of Truckee) have increased steadily over the period of record, rising over 10 feet from 1990 to 2012.
- In well 17N1E17F002M (Donner Creek area), groundwater levels fluctuated seasonally but generally remained constant year to year).

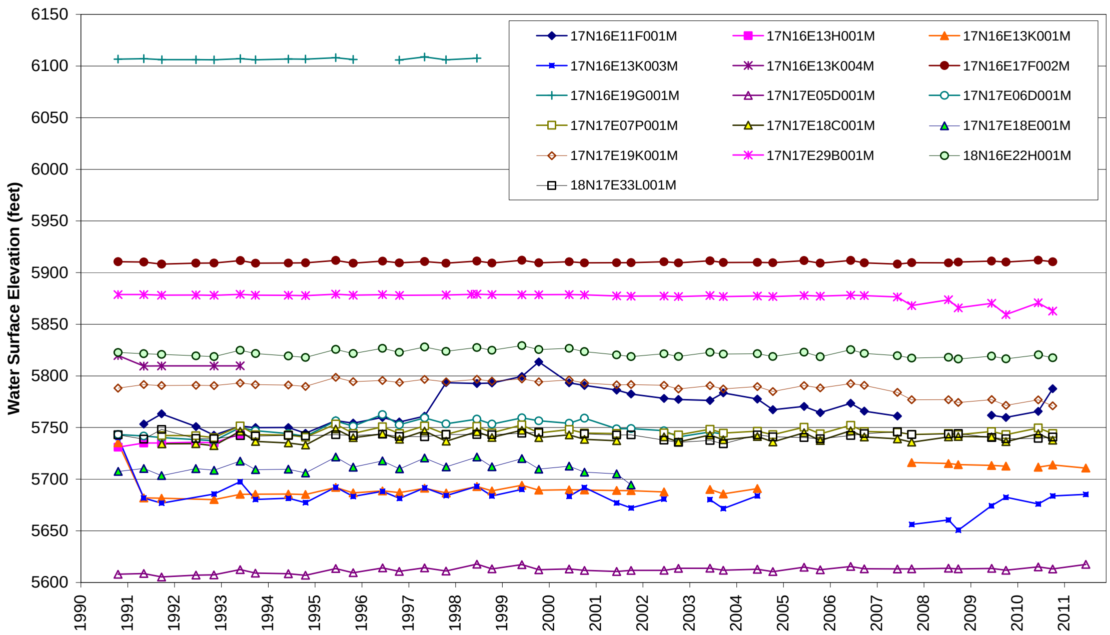


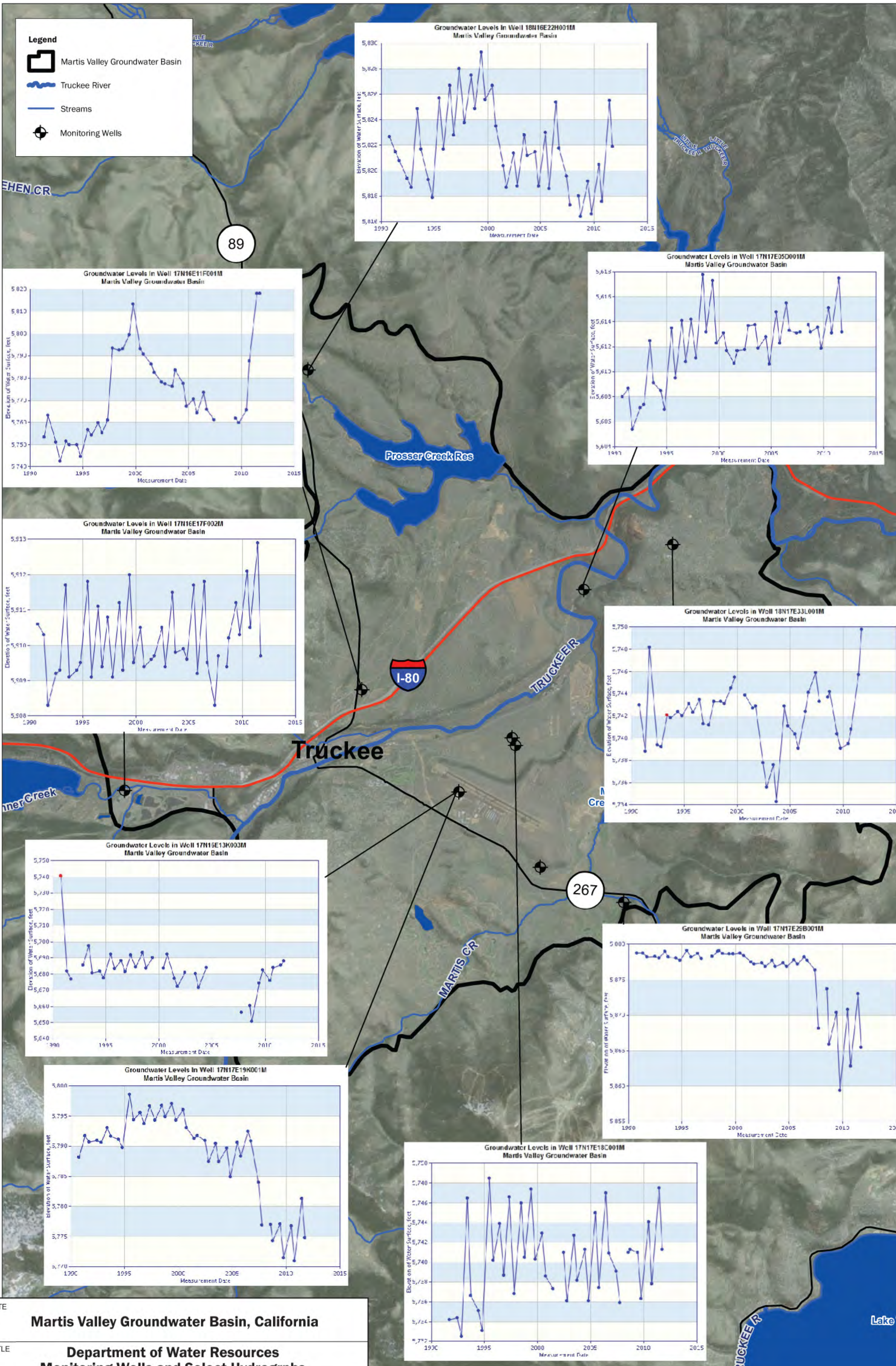
Figure 2-15. Water Levels in DWR Long-term Groundwater Monitoring Wells

2.5.3.1 Land Subsidence

Permanent land subsidence can occur when groundwater is removed by pumpage or drainage due to irreversible compression of aquitard materials. Limited data on land subsidence within the MVGB is available, but no indications of land subsidence have been reported in the documents reviewed as part of this evaluation.

2.6 Groundwater Well Infrastructure

The three partner agencies, hundreds of domestic pumpers, and a number of golf courses rely on the MVGB for drinking water and irrigation supplies. The TDPUD provides water service to portions of the Town of Truckee and adjacent unincorporated areas of Nevada and Placer Counties. The TDPUD currently has 13 active production wells for potable water service, plus 3 wells to serve non-potable water demands. PCWA's Eastern Water System (Zone 4) currently includes two production wells, Lahontan Well #1 and Lahontan Well #2, to serve the Lahontan Golf Club, Shaffer's Mill Golf Club, Hopkins Ranch, and Martis Camp Residences. PCWA is planning to develop a third permanent groundwater production well to serve planned development in and around the existing communities, including Shaffer's Mill Golf Club (Tully and Young, 2011). NCSD supplies water to residents and guests in the Northstar community, producing water from one production well (TH-2) with an estimated yield of 800 gpm. NCSD is currently working to bring a second well (TH-1) online during summer 2012 with a similar anticipated yield. Table 2-2 summarizes the estimated yields and production rates associated with these wells.



SITE

Martis Valley Groundwater Basin, California

TITLE

Department of Water Resources Monitoring Wells and Select Hydrogrphs

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PROJECT 140691

Figure 2-16

Source:?

Table 2-2. Estimated Yield of Public Agency Production Wells[a]	
Well Name	Estimated Maximum Yield (gpm)
NCSD	
TH-2	800
TH-1 (anticipated in 2012)	800 (estimated)
PCWA	
Lahontan Well 1	1,400
Lahontan Well 2	1,400
TDPUD	
A Well	160
Airport	2,140
Prosser Annex	460
Glenshire Drive	1,725
Martis Valley No. 1	1,585
Northside	575
Southside No. 2	200
Southside No. 1 (non-potable)	N/A
Sanders	290
Old Greenwood	870
Hirschdale	35
Prosser Heights	360
Prosser Village	800
Well No. 20	540
Fibreboard (non-potable)	N/A
Donner Creek (non-potable)	N/A

[a] *Well Yield information provided by NCSD, PCWA (Tully and Young, 2011), and TDPUD (Kaufman, 2011)*

A number of private wells are distributed across the basin, and a number of residential neighborhoods or tracts have relatively higher concentrations of wells. Martis Camp operates 2 irrigation wells for their own use and provides Northstar with water from these wells for snowmaking and irrigation purposes as well (Josh Detweiller, NCSD, pers. comm.). At higher elevations in the eastern portion of the basin, the Juniper Hills area includes a number of estates, most of which rely on private wells drilled deep (typically 500 to 800 feet) into uplifted Lousetown volcanics and/or deeper volcanics. In the center of the MVGB, a high density of relatively shallow (200 to 300 feet deep) private wells have been drilled and are in use along Prosser Dam Road. Many of these are drilled into shallow Lousetown volcanics, while others are drilled into glacial outwash and the Prosser Formation. In the northwestern portion of the MVGB a number of homes located on Alder Hill have domestic wells drilled primarily into uplifted Lousetown volcanics and range in depth from 300 to 800 feet.

Figure 2-17 is a cumulative frequency plot derived from DWR data, and shows the number of public and domestic wells drilled at various depths in the MVGB. These data show that the vast majority of domestic wells drilled in the area are relatively shallow, with 50% of domestic wells being installed at depths of 300 feet below ground surface or less, while the public production wells range widely in depth.

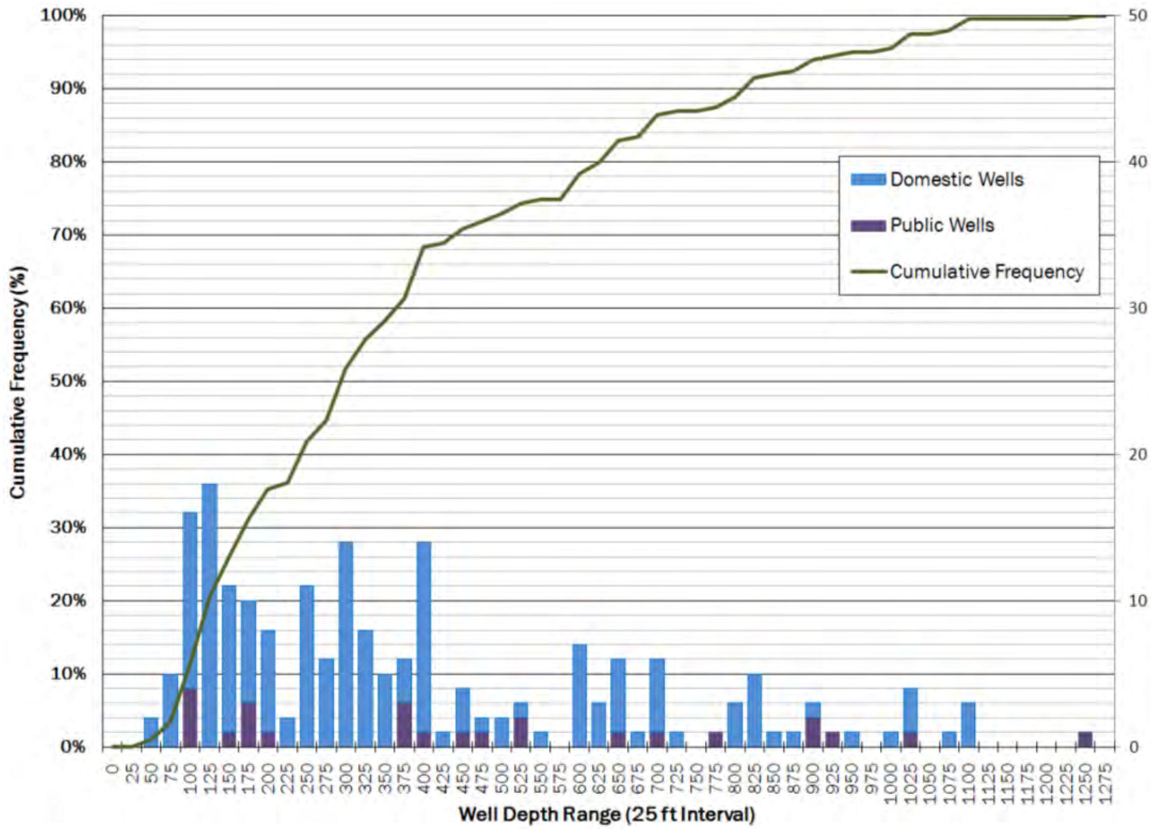


Figure 2-17. Depth Distribution of Wells in the Martis Valley Groundwater Basin

2.7 Groundwater Quality

Groundwater quality in the MVGB is generally of good quality and is currently monitored as part of the agencies' agreements with DPH. Each agency releases an annual water quality report for their service areas in the MVGB; the 2011 annual reports are included in Appendix E. The USGS carried out groundwater monitoring activities in the MVGB in cooperation with the California State Water Resources Control Board (SWRCB) as part of the California Groundwater Ambient Monitoring and Assessment (GAMA) Program (Fram and others, 2007), and sampled 14 wells in the MVGB for a wide range of constituents during summer 2007. The concentrations of most constituents detected in these samples were below drinking-water thresholds, with some exceptions: a) concentrations of arsenic were above the Maximum Contaminant Level (MCL) in 4 of the 14 wells sampled, and b) manganese concentrations were elevated above the MCL in one well. Arsenic levels above the MCL have also been reported by the TDPUD.

The T-TSA operates a water reclamation plant which includes the discharge of tertiary-treated effluent into glacial outwash and Prosser Formation alluvium downstream of the Town of Truckee on the south side of the Truckee River. Hydrogeologic investigations in the vicinity of the plant indicate that effluent flows laterally toward the Truckee River and Martis Creek, discharging to these water bodies after a minimum 50 day travel time (CH2MHill, 1974). DWR (2003) noted that a water quality monitoring program is in place to evaluate potential changes to ground- and surface-water quality.

Sixty-three leaking underground storage tank (LUST) cleanup sites have been identified by the SWRCB's GeoTracker database in the MVGB. Of these 63 sites, cleanup actions for 49 are documented as "completed", while 14 are listed as "open" or "active." All the sites are located in the Town of Truckee, except for one active site in Hirschdale.

2.8 Land Use

Prior to the 1950s, land use in Martis Valley and the Truckee area was primarily ranching and timber related (Shaw and others, 2012). During the 1950s, 60s, and 70s, the rural ranching- and timber-based economy began shifting to more recreational and community development. Today, the primary land uses in the MVGB are residential and ski and/or golf resort related communities with commercial centers in and near downtown Truckee and at the Truckee Airport. Timber and sand and gravel mining operations still continue to operate on a seasonal basis (Shaw and others, 2012).

2.9 Groundwater Recharge

Several previous studies estimated groundwater recharge within the MVGB using water balance and empirical data, resulting in a range from 18,000 to 34,560 acre-feet per year. Recently, DRI has developed annual groundwater recharge estimates using the physically-based PRMS. Table 2-3 summarizes previous and current studies including the study's author, year, and average annual groundwater recharge estimates.

Table 2-3. Summary of Average Annual Groundwater Recharge Estimates for the MVGB

Author	Year	Recharge (ac-ft/yr)
Hydro-Search	1974, 1980, 1995	18,000
Nimbus Engineers	2001	24,700
Kennedy/Jenks Consultants	2001	none
Interflow Hydrology, Inc. and Cordilleran Hydrology, Inc	2003	34,560
DRI, PRMS estimate DRI, modified Maxey-Eakin method	2012	32,745 35,168

DRI outlines its scientific and technical methods, including the climate data used, the PRMS method, and total recharge estimates in a Technical Note, which is included in Appendix F. PRMS simulates land surface hydrologic processes of evapotranspiration, runoff, infiltration, and interflow by balancing energy and mass budgets of the plant canopy, snowpack, and soil zone on the basis of distributed climate information. The PRMS computed recharge consists of the sum of shallow infiltrated water that discharges into the Truckee River and its tributaries as well as deep percolation of ground water to deeper aquifers with water supply wells (Rajagopal and others, 2012). DRI's study "...also applied a modified Maxey-Eakin (1949) method to estimate recharge which relates mean annual precipitation to recharge using recharge coefficients applied to precipitation amounts."

The PRMS is modeled for the years 1983 to 2011 with annual recharge estimates ranging from 12,143 ac-ft/yr (dry year) to 56,792 ac-ft/yr (wet year), with an average annual recharge estimate of 32,745 ac-ft/yr. Because annual precipitation drives recharge, the PRMS simulated recharge varies from year to year. DRI included in its Technical Note annual recharge efficiency, or the ratio of annual recharge to annual precipitation. For the MVGB, the calculated annual recharge efficiency is 18-26%. Figure 2-18 shows the average annual groundwater recharge as simulated by the PRMS model, for a period of record from 1983 to 2011. Figure 2-19 shows the annual recharge for the year 1988, a dry year. Figure 2-20 shows the annual recharge for the year 1995, a wet year.

2.10 Water Use

Groundwater use in the MVGB is primarily for municipal, domestic, and recreational uses. The TDPUD and PCWA have summarized water supply and demand as part of Urban Water Management Plans completed for their respective service areas (Tully and Young, 2011; Kaufman, 2011). Average potable day demand served by the TDPUD in 2010 was reported to be 4.53 million gallons per day (mgd); 5,073 acre-feet per year (ac-ft/yr)). From 2005 to 2009, production from PCWA wells has increased from an average day demand of 0.04 to 0.13 mgd (44 to 141 ac-ft/yr).

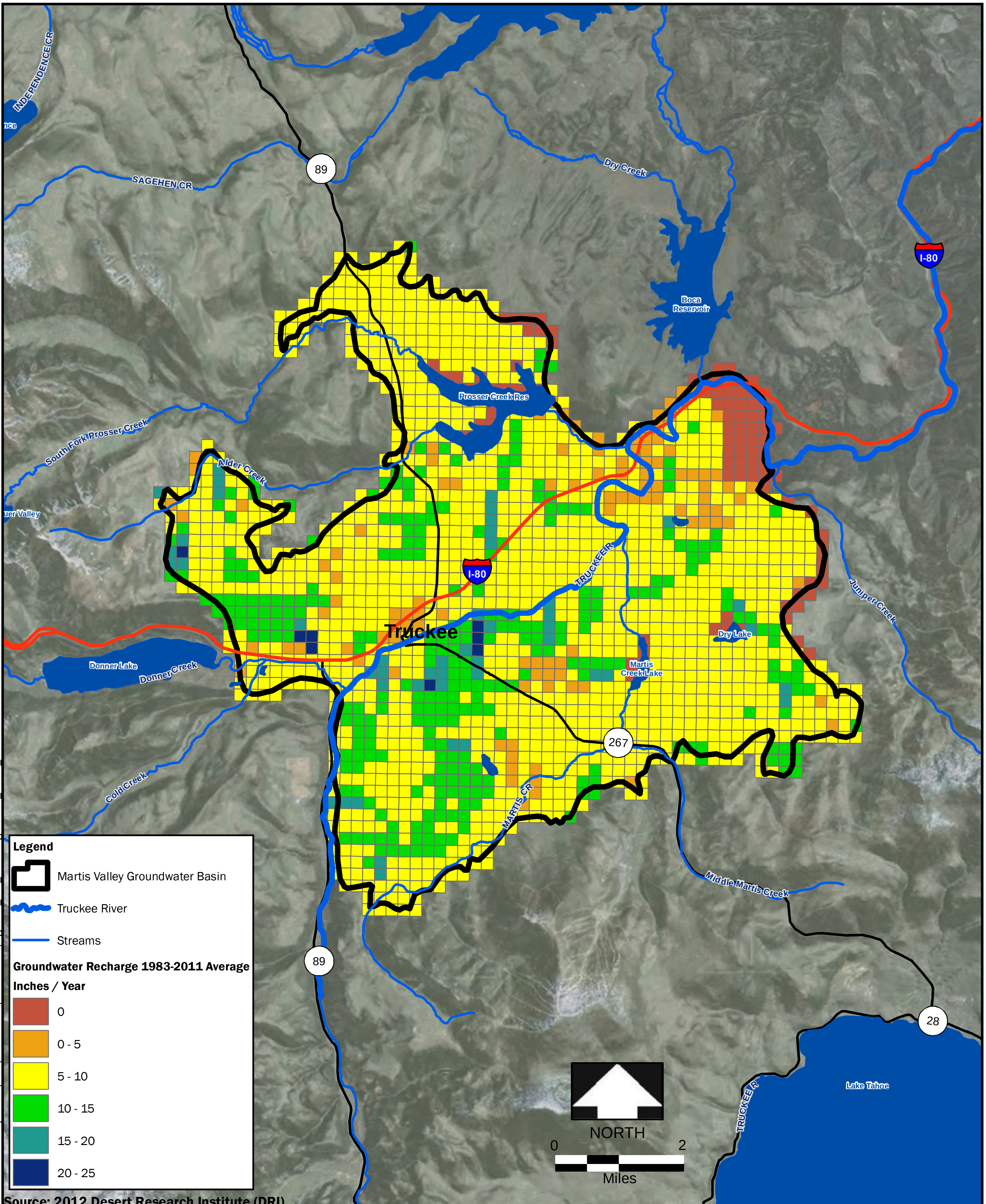
NCSD meets demand primarily from its Big Springs collection system, outside of the MVGB, and uses water pumped from TH-2 (and in the future, TH-1) to augment this supply (J. Detwiler, pers. comm.). Demand on the MVGB imposed by NCSD operations is best represented by pumping records from Well TH-2. Annual water volumes pumped by NCSD averaged 0.18, 0.36, and 0.29 mgd (200, 398, and 320 ac-ft/yr) in water years 2008, 2009, and 2010, respectively.

Nine golf courses depend on the MVGB for irrigation supply; four are supplied by TDPUD (one uses a potable supply and 3 are non-potable), 1 is supplied by NCSD (potable), and 4 are supplied privately and assumed to be all non-potable. Using the partner agencies records of non-potable water pumped and supplied to the majority of the courses, the average non-potable demands range from 0.19 ac-ft/yr to 0.25 ac-ft/yr (210 ac-ft/yr to 279 ac-ft/yr), with an average of 0.24 mgd (272 ac-ft/yr). This average demand rate of 0.24 mgd is applied to the four privately-supplied courses for an estimated production of 993 ac-ft/yr.

Based on the available data and summarized in Table 2-4, current annual production from the MVGB is estimated to be approximately 9,341 ac-ft/yr. Kaufman (2011) estimates buildout water demand for all users in the MVGB to be approximately 21,000 ac-ft/yr.

Table 2-4. Estimated Current Groundwater Production

	mgd	ac-ft/yr
TDPUD		
Potable - Average (2007-2010)	5.78	6,475
Golf Course non-potable – Average (2001-2011)	0.75	837
PCWA		
Potable – Average (2009)	0.10	141
NCSD		
Potable - Average (2008-2010)	0.08	96
Golf Course (potable) – Average (2009-2011)	0.19	210
Snowmaking (Water Year 2011)	0.53	589
Privately Supplied Golf Courses		
Total estimated non-potable production	0.96	993
Estimated Total Demand	8.39	9,341



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DATE	PROJECT
9-17-12	140691

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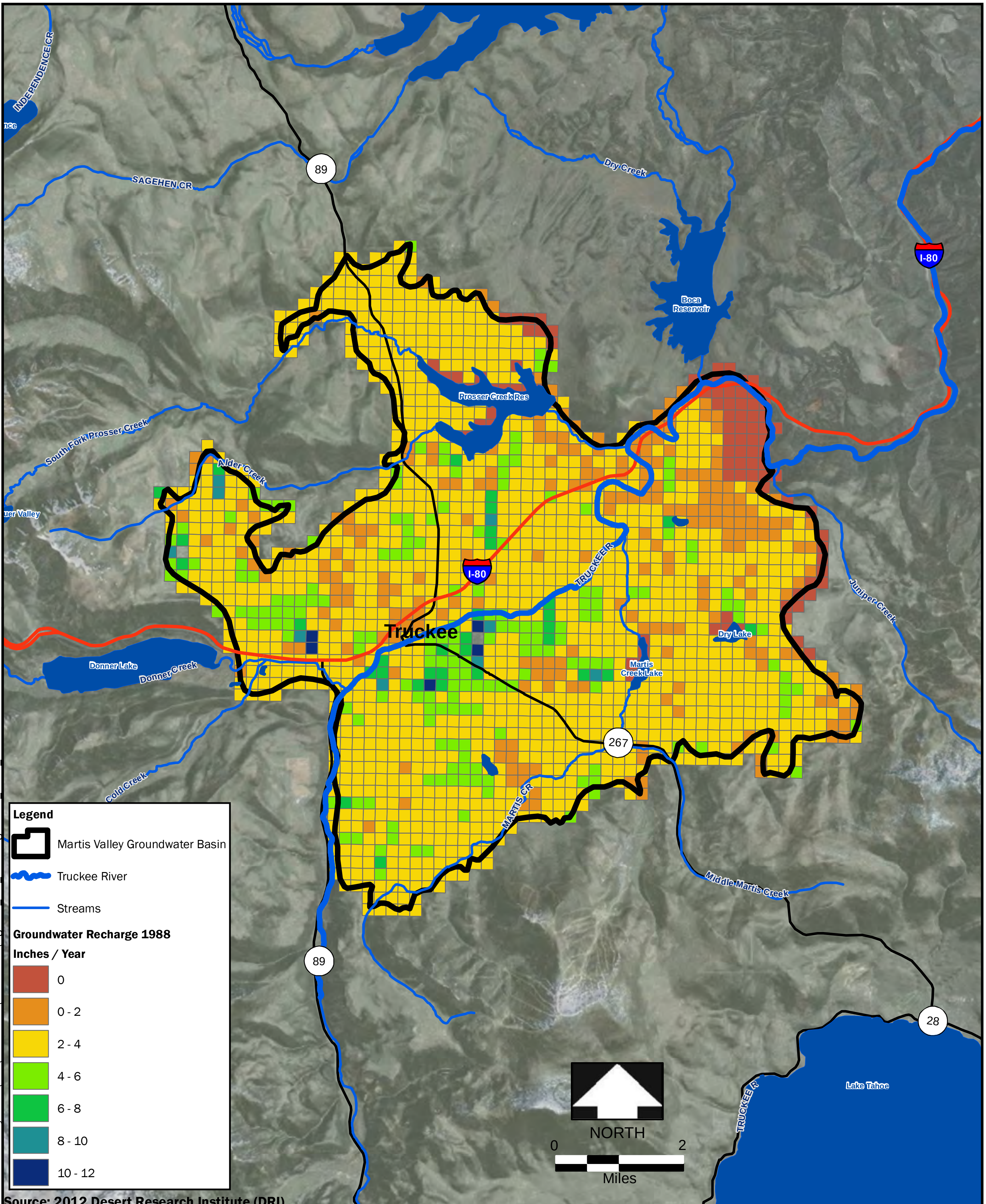
Martis Valley Groundwater Basin, California

TITLE

Average Annual Groundwater Recharge 1983-2011

Figure 2-18



Source: 2012 Desert Research Institute (DRI)

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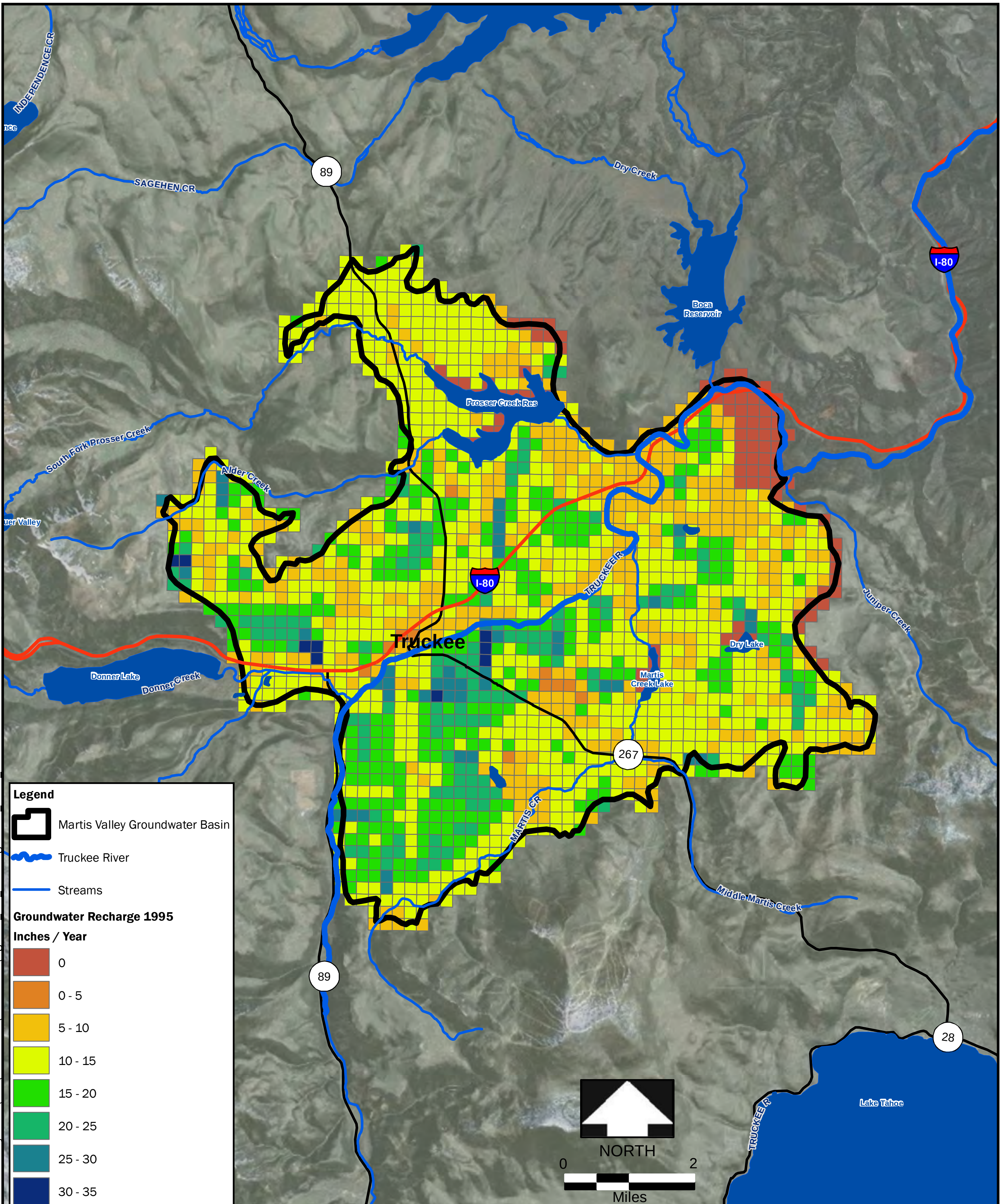
DATE	PROJECT	SITE
9-17-12	140691	Martis Valley Groundwater Basin, California

Brown AND Caldwell

TITLE

Annual Groundwater Recharge 1988

Figure 2-19



Source: 2012 Desert Research Institute (DRI)

DATE	PROJECT	SITE
9-7-12	140691	Martis Valley Groundwater Basin, California

Brown AND Caldwell

TITLE

Annual Groundwater Recharge 1995

Figure 2-20

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Section 3
Plan Implementation

The partner agencies are already performing many of the groundwater management activities associated with an AB 3030 GMP. Through GMP implementation, the partner agencies formalize their groundwater management goal, BMOs, and implementation actions that elaborate on both current actions and planned future actions under the GMP. As discussed in Section 1.6 and shown on Tables 1-2, 1-3, and 1-4, a number of required, voluntary, and suggested components constitute a GMP.

This chapter discusses implementation actions that are grouped under each BMO. The BMOs are fully described in Section 1.5, and are listed below:

1. Manage groundwater to maintain established and planned uses.
2. Manage groundwater use within the provisions of the Truckee River Operating Agreement.
3. Collaborate and cooperate with groundwater users and stakeholders in the Martis Groundwater Basin.
4. Protect groundwater quantity and quality.
5. Pursue and use the best available science and technology to inform the decision making process.
6. Consider the environment and participate in the stewardship of groundwater resources.

3.1 Implementation Actions that Support BMO #1 - Manage Groundwater to Maintain Established and Planned Uses

The MVGB is the primary source of water to multiple users under separate jurisdictions. BMO #1 encourages the partner agencies to pursue management of groundwater that is within their jurisdiction in order to protect existing uses.

Implementation actions identified as falling under BMO #1 facilitate the management of groundwater in the MVGB. These implementation actions are focused on regular communication and consideration of future programs intended to protect the groundwater resource from degradation and depletion.

3.1.1 Develop and implement a summary report every five years

This action is intended to concentrate and document GMP activity, data, and management decisions into periodic reports for use by partner agencies, Stakeholders, and local planning agencies for continual groundwater management decisions and maintenance.

This implementation action provides a report every five years that summarizes groundwater conditions and management activities, and presents an opportunity to update and improve the GMP. The summary report will include:

- A summary of monitoring results with a discussion of historical trends.
- A summary of management actions during the period covered by the report.
- A discussion of whether actions are achieving progress towards meeting BMOs.
- A summary of proposed management actions for the future.
- A summary of any GMP changes that occurred during the period covered by the report.
- A summary of actions taken to coordinate with other water and land agencies and other government agencies.

- Recommendation of updates and changes to the GMP.

3.1.2 Compile an annual summary of groundwater monitoring data

This action will compile, organize and evaluate groundwater level elevation and groundwater quality monitoring data collected during the previous year. The annual summary of monitoring data will include groundwater level monitoring information from the partner agencies water level monitoring efforts, and water quality data collected by the partner agencies from production wells. The annual summary of groundwater monitoring data will be used by the agencies at the annual GMP implementation meeting described in Section 3.1.3 to evaluate the need to implement other portions of the GMP that are contingent on monitoring data. The annual summary of groundwater monitoring data will also be included in the five year summary report.

3.1.3 Partner agencies to meet annually to discuss GMP implementation

This action will require the partnership agencies to meet at least once annually to discuss GMP implementation. Currently, the partner agencies meet in the Truckee area annually and GMP implementation will be added as an agenda item during this annual meeting.

3.1.4 Support TROA provisions associated with well construction, repair, modification, and destruction

The Settlement Act may eventually establish additional requirements for the siting and construction of wells drilled in the Truckee River Basin, which includes the MVGB. Section 6.E of TROA outlines Truckee River basin allocation procedures including well construction, repair, modification and destruction to address groundwater-surface water interactions within the Truckee River Basin including areas of Martis Valley. Section 204(c)(1)(B) of the Settlement Act provides that, "…all new wells drilled after the date of enactment of this title shall be designed to minimize any short-term reductions of surface streamflows to the maximum extent feasible." This implementation action supports the implementation of TROA's well construction guidelines.

3.1.5 Evaluate and consider taking a position on relevant water resources-related policies, programs, and projects under consideration by local, State and Federal agencies

Throughout the state, surface water and groundwater resource management are becoming critical components of meeting growing water supply demands. As part of this implementation action, the partner agencies will actively evaluate and consider policies, programs and projects that may impact water resources quality and/or quantity within the Martis Valley.

3.1.6 Pursue opportunities for improved groundwater basin monitoring and reporting with local, State, and Federal agencies

This implementation action prompts the partner agencies to continuously pursue opportunities and funding that may provide additional groundwater data collection and/or reporting. Groundwater monitoring is a critical component in understanding the physical condition of the groundwater basin and is further described in Section 3.3.1.

3.1.7 Evaluate the need for programs to facilitate saline intrusion control, mitigate the migration of contaminated groundwater, facilitate conjunctive use, and to mitigate overdraft

This implementation action includes evaluation of a variety of potential programs to manage groundwater within the jurisdiction of the partner agencies. As part of this action, the agencies will evaluate the need for saline intrusion controls, mitigation of the migration of contaminated groundwater, conjunctive use programs, and overdraft mitigation.

Currently, the groundwater supply in Martis Valley is not threatened by saline intrusion, contaminant plumes, or in a state of overdraft that would warrant immediate steps for mitigation. Saline intrusion is a primary concern along coastal areas with intruding sea water, which is high in Total Dissolved Solids (TDS) that may threaten fresh groundwater supplies. Saline conditions may also occur in interior basins. In the Martis Valley, groundwater monitoring (discussed under Section 3.4), will assist in identifying saline issues. Should future monitoring indicate that saline intrusion is a potential problem in the MVGB, the partner agencies will evaluate development of a saline intrusion control program.

Groundwater contamination in the MVGB falls under the jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB). Should monitoring indicate a large scale groundwater contamination issue, the partner agencies will share knowledge of the issue and collaborate with the LRWQCB. If monitoring indicates that contaminated groundwater is migrating, the partner agencies will further collaborate with the LRWQCB to mitigate the migration.

Conjunctive use is the management of surface water and groundwater to optimize the yield of the overall water resource. One method would be to rely primarily on surface water in wet years and groundwater in dry years. Other methods employ artificial recharge, where surface water is intentionally stored into aquifers for later use. NCSD currently manages both its springwater and groundwater supply and TDPUD currently relies solely on groundwater but maintains water rights to several springs. Groundwater is PCWA's only supply source. The partner agencies will evaluate opportunities to increase the use of conjunctive management as they arise within the MVGB.

Groundwater overdraft occurs when pumping exceeds recharge to a groundwater basin. If monitoring indicates through declining groundwater levels that groundwater overdraft is occurring, the partner agencies will consider development of programs to mitigate the groundwater overdraft.

3.1.8 Consider development of contamination cleanup, recharge, storage, conservation and water recycling projects

This implementation action includes evaluation of a variety of potential programs to manage groundwater within the jurisdiction of the partner agencies. As part of this action, the partner agencies will consider development of projects that cleanup contamination, increase groundwater recharge and storage, or increase conservation and water recycling.

The LRWQCB is responsible for developing and enforcing water quality objectives and plans that best protect the State's waters within its hydrologic area. Should monitoring indicate that contaminated groundwater is a threat to groundwater supplies, the partner agencies will consider collaborating with the LRWQCB.

During GMP implementation, opportunities may arise for the partner agencies to engage in activities related to groundwater recharge, storage, conservation and recycling. As those opportunities arise, the agencies will consider participating in projects to improve groundwater recharge, storage, conservation and recycling efforts.

3.1.9 Pursue funding sources for implementation of plan policies, programs, reporting and projects

This implementation action directs the partner agencies to pursue funds from Federal, State and other sources as they become available and are beneficial to pursue. Funding sources may include Local Groundwater Assistance (LGA) grants and Integrated Regional Water Management Planning (IRWMP) grants from DWR, grants from the California Department of Public Health (DPH), various funds available through collaboration with the U.S. Bureau of the Interior, and other agencies.

3.1.10 Participate in the evaluation of relevant local projects to maintain groundwater quantity and quality

Local groups and local, State or Federal agencies may develop opportunities that seek support or assistance for projects that affect groundwater quantity and/or quality in the Martis Valley. This action directs the partner agencies to participate in relevant local projects as appropriate and reasonable.

3.1.11 Summary of BMO #1 Actions

Table 3-1 presents a summary of implementation actions to be undertaken by the partner agencies that support BMO #1 including the anticipated schedule of implementation.

Table 3-1. Summary BMO#1 Supporting Implementation Actions

	Description of Action	Implementation Schedule
1-1	Develop and implement a summary report every five years that includes: A summary of monitoring results, with a discussion of historical trends A summary of management actions during the period covered by the report A discussion of whether actions are achieving progress towards meeting BMOs A summary of proposed management actions for the future A summary of any GMP changes that occurred during the period covered by the report A summary of actions taken to coordinate with other water and land agencies and other government agencies Review of the GMP and consider updates to the GMP	Once every five years, first summary report to be completed in 2018
1-2	Compile an annual summary of groundwater monitoring data	Annually
1-3	Partner agencies to meet annually to discuss GMP implementation	Annually
1-4	Support TROA provisions associated with well construction, repair, modification, and destruction	As Needed
1-5	Evaluate and consider taking a position on relevant water resource-related policies, programs, and projects under consideration by local, State and Federal agencies	As Needed
1-6	Pursue opportunities for improved groundwater basin monitoring and reporting with local, State, and Federal agencies	As Needed
1-7	Evaluate the need for programs to facilitate saline intrusion control, mitigate the migration of contaminated groundwater, facilitate conjunctive use, and to mitigate overdraft	As Needed
1-8	Consider development of contamination cleanup, recharge, storage, conservation and water recycling projects	As Needed
1-9	Pursue funding sources for implementation of plan policies, programs, reporting and projects	Ongoing
1-10	Participate in the evaluation of relevant local projects to maintain groundwater quantity and quality	As Needed

3.2 Implementation Actions that Support BMO #2 - Manage Groundwater within the Provisions of TROA

The Settlement Act, Public Law 101-618 (1990), established entitlements to the waters of Lake Tahoe, the Truckee River and its tributaries, and how the storage reservoirs of the Truckee River are operated. Section 205 of the Settlement Act directs the Secretary of the Department of the Interior to negotiate an operating agreement for the operation of Truckee River reservoirs, between DWR, Nevada, Nevada

Energy (formerly Sierra Pacific Power Company), Pyramid Tribe, and the United States Bureau of Reclamation. The operating agreement is known as TROA.

Section 204(c)(1) of the Settlement Act outlines the allocation of 32,000 acre-feet of water (both surface and groundwater) to the State of California from within the Truckee River Basin. The Settlement Act may eventually establish additional requirements for the siting and construction of wells drilled in the Truckee River Basin, which includes the MVGB. Section 6.E of TROA outlines Truckee River Basin allocation procedures including surface water diversions and water accounting procedures. Article 10 of TROA identifies well construction, repair, modification and destruction to address groundwater-surface water interactions within the Truckee River Basin including areas of Martis Valley. Section 204(c)(1)(B) of the Settlement Act provides that, "…all new wells drilled after the date of enactment of this title shall be designed to minimize any short-term reductions of surface streamflows to the maximum extent feasible." Article 10 of TROA requires that new water supply wells be designed to minimize impacts to surface water and outlines siting and design processes. Wells drilled or under construction before May 1, 1996 are presumed to comply with the Settlement Act.

This BMO documents the partner agencies' commitment to continue to comply with provisions of TROA. There are provisions in TROA that apply to groundwater and water wells within the Truckee River Basin (which includes the Martis Valley) to address potential adverse impacts to surface water.

3.2.1 Continue coordination and collaboration with TROA agencies on groundwater management issues and source well development

This implementation action directs the partner agencies to coordinate and collaborate with TROA agencies as necessary to be compliant with the Settlement Act. To meet this implementation action, the agencies will continue regular contact with TROA agencies as appropriate.

3.2.2 Summary of BMO #2 Actions

Table 3-2 presents a summary of implementation actions to be undertaken by the partner agencies that support BMO #2 including the anticipated schedule of implementation.

Table 3-2. Summary BMO#2 Supporting Implementation Actions

Description of Action		Implementation Schedule
2-1	Continue coordination and collaboration with TROA agencies on groundwater management issues and source well development	Ongoing

3.3 Implementation Actions that Support BMO #3 - Collaborate and Cooperate with Groundwater Users and Stakeholders in the Martis Valley Groundwater Basin

With one common groundwater supply it makes sense to share information and resources toward similar goals. This objective encourages the partner agencies to reach out to other agencies and groundwater users within the MVGB.

3.3.1 Formalize and institute a Stakeholder Working Group to meet at least annually or as needed on GMP implementation activities and updates

The SWG has been a key component of the GMP development process and will be continued into the implementation phase. This implementation action directs the partner agencies to continue using a

SWG during implementation of the GMP. The SWG will continue to work cooperatively with the partner agencies and will meet at least once a year to discuss GMP implementation.

3.3.2 Collaborate with the LRWQCB to limit the migration of contaminated groundwater and in development of large scale contamination clean up programs

This implementation action directs the partner agencies to communicate, collaborate, and coordinate with the LRWQCB on groundwater contamination issues. There are no currently identified large scale groundwater contamination issues in the Martis Valley at this time. Communication with the LRWQCB allows for collaboration in the event of the identification of groundwater contamination and collaboration with the LRWQCB on the prevention of contaminant migration.

3.3.3 Work cooperatively with local stakeholders and local, State and Federal agencies on groundwater management activities, projects, and studies

Strong relationships with Federal, State, and local agencies and stakeholders are critical in developing and implementing many of the GMP's implementation actions. The partner agencies are already working cooperatively with local stakeholders and agencies on groundwater management, as evidenced by the use of the SWG during GMP development. This implementation action directs the partner agencies to communicate and work cooperatively with local groundwater interests, and includes outreach activities aimed to educate agencies and stakeholders on groundwater management opportunities and activities in the MVGB.

3.3.4 Identify opportunities for public involvement during GMP implementation

Informing the public of GMP implementation activities increases local understanding and support of GMP activities. This implementation action encourages the partner agencies to inform and invite the public to participate in GMP implementation activities. Public information and involvement may take place in the form of a specific webpage designed to communicate GMP implementation actions, public meetings, and at agency board meetings, as well as other activities.

3.3.5 Summary of BMO #3 Actions

Table 3-3 presents a summary of implementation actions to be undertaken by the partner agencies that support BMO #3 including the anticipated schedule of implementation.

Table 3-3. Summary BMO#3 Supporting Implementation Actions

Description of Action		Implementation Schedule
3-1	Formalize and institute a Stakeholder Working Group to meet at least annually or as needed on GMP implementation activities and updates.	Annually
3-2	Collaborate with the LRWQCB to limit the migration of contaminated groundwater and in development of large scale contamination clean up programs	As Needed
3-3	Work cooperatively with local stakeholders and local, State and Federal agencies on groundwater management activities, projects and studies	Ongoing
3-4	Identify opportunities for public involvement during plan implementation	Ongoing

3.4 Implementation Actions that Support BMO #4 - Protect Groundwater Quantity and Quality

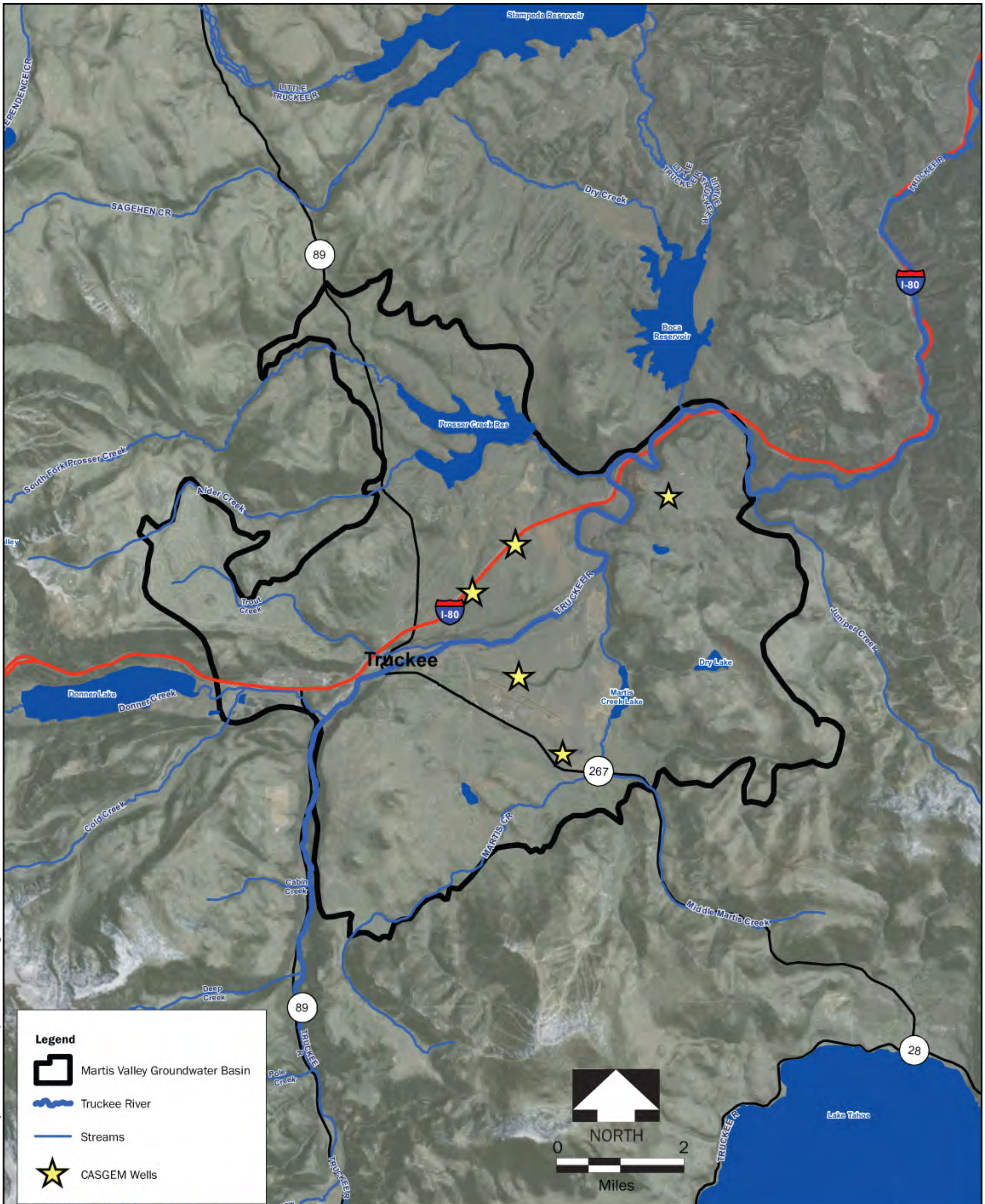
Groundwater performs an integral function in a watershed, one of which is satisfying water supply needs. Improving the understanding of the regional supplies is a critical step in protecting and sustaining the Martis Valley groundwater supply.

The collection, evaluation and analysis of groundwater monitoring data including water quality and water levels on a regular basis is the cornerstone in understanding the MVGB's groundwater resources and provides critical information for management decisions. Groundwater level monitoring can identify areas of overdraft, enabling appropriate management decisions and responses. Groundwater quality monitoring can help identify areas of degrading water quality, potentially identifying specific water quality issues. Ongoing groundwater monitoring provides information needed to document current conditions, assess long-term trends, and to support development and implementation of GMP components.

Groundwater data is collected by both DWR and the partner agencies on a regular basis; and by the USGS on a less regular basis. Accumulating, processing, evaluating, summarizing and reporting the available data for discussion and distribution will be required to make informed decisions regarding continued groundwater supply and demand. Additionally, surface water data is collected by local, State, and Federal agencies and is evaluated by the appropriate agency for their own purpose. These data are critical and can be used in conjunction with the accumulated groundwater data to help improve the understanding of surface water-groundwater relationships.

3.4.1 Establish and maintain a California Statewide Groundwater Elevation Monitoring compliant monitoring program

This implementation action directs the partner agencies to continue their California Statewide Groundwater Elevation Monitoring (CASGEM) compliant monitoring program (included as Appendix D). Figure 3-1 shows the locations of CASGEM monitoring wells in the MVGB. CASGEM monitoring results will be used in the annual groundwater monitoring summary prepared under implementation action 1-2.



DATE	PROJECT	SITE
9-7-12	140691	Martis Valley Groundwater Basin, California
		TITLE
		CASGEM and DWR Groundwater Monitoring Wells

Brown AND Caldwell

Figure 3-1

3.4.2 Continue and Encourage Water Conservation Activities and Public Education

The partner agencies currently implement significant water conservation and public outreach programs per State requirements. All three agencies hold public board meetings and maintain informative websites for public outreach purposes at the following web addresses:

- www.tdpud.org
- www.pcwa.net
- www.northstarcsd.org

This implementation action encourages the partner agencies to continue to implement conservation activities and continue public outreach activities as opportunities become available.

3.4.3 Work with local stakeholders and DWR to identify areas that may need additional groundwater level and groundwater quality monitoring based on identified data gaps or negative performance trends

Currently, groundwater is monitored by the partner agencies under CASGEM, and by DWR, who monitors a number of wells in the MVGB. DWR monitoring wells are shown in Figure 3-1. This implementation action requires the partner agencies to work with local stakeholders and DWR to identify areas in need of additional monitoring. The SWG included two DWR North Central Region office staff and future members of the SWG should continue to include DWR staff. Through the SWG, the partner agencies will be working with local stakeholders and DWR, and will discuss identification of additional monitoring areas at the SWG annual meetings.

3.4.4 Coordinate with other agencies, including DWR and the USGS to identify opportunities for land subsidence monitoring

Inelastic land subsidence is caused by dewatering of aquifers and the compressing of clays. As water is removed from the aquifer, it is transported through interconnected pore spaces between grains of sand and gravel. If an aquifer has intervals of clay or silt within it, the lowered water pressure in the sand and gravel results in the slow drainage of water from the clay and silt beds. The decreased water pressure reduces the support for the clay and silt beds. Because these beds are compressible, they compact (become thinner) and the effects are seen as a lowering of the land surface. The lowering of the land surface elevation from this process is often permanent (inelastic). Recharge of the aquifer will not result in an appreciable recovery of the land-surface elevation.

The partner agencies have not developed a network of extensometers to measure inelastic land subsidence. Groundwater level monitoring indicates that groundwater levels have not been significantly lowered, a condition required for land subsidence due to groundwater extraction to occur. Additionally, the geology (Section 2.4) in the MVGB does not consist of large layers of clay to be compressed, and is unlikely to experience inelastic land subsidence even if groundwater levels begin to decline. Based on a review of groundwater elevation trends over time, it can reasonably be assumed that significant land subsidence has not occurred on a regional scale due to groundwater extraction within the MVGB.

Under this implementation action, the partner agencies will coordinate with DWR and the USGS to identify opportunities for collaboration to detect land subsidence. Because inelastic land subsidence is tied to groundwater levels, the primary means for early detection include:

- Monitor and analyze groundwater levels, watching for significant declines
- Inspect wells for anecdotal evidence of subsidence during groundwater level monitoring

Monitoring groundwater levels with concurrent inspections for anecdotal evidence of subsidence is the least expensive, and least reliable, method to monitor for land subsidence. Declines in groundwater levels can be a precursor to land subsidence. Staff performing water level monitoring can inspect the monitoring well for indicators of subsidence. Anecdotal subsidence indicators include cracks in the well pad, elevation of the well casing in comparison to the ground surface, and cracks in the ground surface.

3.4.5 Evaluate the need for, and advocate for, as necessary, a wellhead protection, groundwater recharge area protection, and other programs as necessary in MVGB

Wellhead protection is a component of the Drinking Water Source Assessment and Protection (DWSAP) program administered by the DPH. The purpose of the DWSAP program is to protect groundwater sources of public drinking water supplies from contamination, thereby eliminating the need for costly treatment to meet drinking water standards. There are three major components to the DWSAP program, including: Delineation of capture zones around source wells, inventory of potential contaminating activities within protection areas, and analysis of vulnerabilities.

The partner agencies are in compliance with the DWSAP program, will work to comply with the DWSAP program into the future, and will consider supporting programs that will protect groundwater quality in the MVGB.

3.4.6 Map and share groundwater recharge zones

This GMP identifies preliminary areas of groundwater recharge in the MVGB in Section 2.9. Once the groundwater model is calibrated and finalized, groundwater recharge zones will be updated during the scheduled plan update identified in Section 3.1.1. This implementation action encourages the partner agencies to share the recharge zone maps developed in this GMP with local land use agencies to consider in land use decisions.

3.4.7 Provide relevant information to land use agencies regarding groundwater availability

Through GMP implementation activities, such as CASGEM monitoring, groundwater monitoring summary reports and annual meetings of the SWG, the partner agencies will develop water resources information about the MVGB. As development increases in the MVGB, local land use agencies will be faced with decisions regarding zoning and permitting. In Placer County, the Community Development Resource Agency leads development of the County’s general plan and land development activities. The Nevada County Community Development Agency is responsible for the Nevada County General Plan and zoning, and the Town of Truckee has developed its own general plan and zoning. This implementation action directs the partner agencies to communicate relevant groundwater information to the appropriate planning agencies to assist them in making informed land use decisions.

3.4.8 Summary of BMO #4 Actions

Table 3-4 presents a summary of implementation actions to be undertaken by the partner agencies that support BMO #3 including the anticipated schedule of implementation.

Table 3-4. Summary BMO#4 Supporting Implementation Actions

	Description of Action	Implementation Schedule
4-1	Establish and maintain a CASGEM compliant monitoring program	Ongoing
4-2	Continue and encourage water conservation activities and public education	Ongoing
4-3	Work with local stakeholders and DWR to identify areas that may need additional groundwater level and groundwater quality monitoring based on identified data gaps or negative performance trends	Annually

Table 3-4. Summary BMO#4 Supporting Implementation Actions		
	Description of Action	Implementation Schedule
4-4	Coordinate with other agencies, including DWR and the USGS to identify opportunities for land subsidence monitoring	As Needed
4-5	Evaluate the need for, and advocate for, as necessary, a wellhead protection, groundwater recharge area protection, and other programs as necessary in MVGB	As Needed
4-6	Map and share groundwater recharge zones	Ongoing
4-6	Provide relevant information to land use agencies regarding groundwater availability	As Needed

3.5 BMO #5 - Pursue and use the best available science and technology to inform the decision making process.

Science and technology continue to develop new tools that may improve our understanding of the MVGB. This objective encourages the partner agencies to take actions that work with the best available science to help make informed agency decisions.

The partner agencies are currently working to develop the best groundwater science available by collaborating with the Bureau of Reclamation (Reclamation) and DRI to develop an integrated watershed-groundwater model in conjunction with the Martis Valley GMP. The geologic investigation conducted and documented in Section 2 of this report has been used to shape a bi-modal geologic framework which was used to develop the conceptual model for the hydrogeology of the subsurface components of the integrated watershed model. The integrated model is under development in parallel with the GMP and is not completed at the time of the issuance of the draft GMP.

The integrated watershed model is comprised of a PRMS and MODFLOW coupled together using an UZF package. The PRMS is used to model surface water within the watershed, the MODFLOW is used to model groundwater within the MVGB, and UZF is a kinematic wave vadose zone model used to model the interaction between surface water and groundwater. Each model will be calibrated separately, and then calibrated together over a ten year period using a coupled GSFLOW. Calibrations will be conducted using multiple GCM projections of precipitation and temperature to investigate the influence of future climate on water resources. Calibration targets for GSFLOW will include head values measured from wells, meadow and spring locations, streamflows, measured snow depth, and remotely sensed snow cover.

The integrated model's model domain will cover the entire MVGB, and the watersheds that contribute surface water to the region up to Lake Tahoe. The model grid's cells are 300 meters by 300 meters in size.

The partner agencies will obtain a copy of the groundwater model component for future use.

3.5.1 Work with State and Federal agencies to attempt to secure funding for expansion of the partner agencies' monitoring grid

Increasing the number of monitoring points and frequency of monitoring provides for better long term understanding of groundwater trends in the MVGB. Monitoring locations can be added by drilling new, dedicated monitoring wells, and by reaching agreements with well owners that have wells suitable for monitoring activities. Suitable wells will have a driller's log that describes well construction and sediments encountered, a short screened interval, a sanitary seal to prevent surface water from entering the well, and cannot be municipal supply wells.

The partner agencies are currently working with DWR to expand the monitoring grid by submitting a competitive grant application under DWR's LGA program. The agencies' application includes plans to drill and install three monitoring wells located across the Martis Valley.

This implementation action directs the partner agencies to collaborate with State agencies such as DWR, DPH, and others, as well as Federal agencies such as Reclamation, to acquire funding for improvements to the groundwater monitoring grid in the MVGB.

3.5.2 Maintain relationship with DWR for groundwater monitoring and database management activities

The partner agencies are a designated monitoring entity under DWR's CASGEM program. DWR staff have been an integral part of the SWG during GMP development and their contribution in the SWG is anticipated during GMP implementation.

This implementation action directs the partner agencies to continue to maintain a collaborative relationship with DWR for monitoring and database management activities in the MVGB. A continued relationship with DWR benefits the GMP by continuing the monitoring of long-term monitoring wells (especially those with long periods of records), and ensures that DWR groundwater expertise is involved during plan implementation activities through the SWG.

3.5.3 Identify opportunities for collecting water quality monitoring data

The purpose of water quality monitoring as a GMP implementation action is to assess regional trends in water quality that may be caused by changes in groundwater-related activities. For example, groundwater pumping may induce groundwater flow from deeper aquifers or hard rock areas that are less desirable, such as water with a high mineral content or arsenic. Groundwater quality monitoring from a basin-wide perspective is focused on information that is indicative of overall groundwater basin conditions and not focused on individual anthropogenic contaminants. Localized anthropogenic groundwater quality contaminants fall under the jurisdiction of the LRWCQB.

Groundwater quality is currently monitored as part of the agencies' agreements with DPH. Each agency releases an annual water quality report for their service areas in the MVGB, and maintains databases of water quality information. Partner agency annual water quality reports are included in Appendix E.

Additional opportunities exist to collect groundwater quality information by collaborating with other State and Federal programs, such as the USGS funded California Groundwater Ambient Monitoring and Assessment Special Studies Program (GAMA). The 2007 GAMA study collected water quality data in the MVGB from 52 groundwater wells. The GAMA fact sheet for the MVGB is included in Appendix E.

Another example of how the partner agencies optimize collaboration opportunities occurred in February, 2012. The partner agencies teamed with Lawrence Livermore National Laboratory (LLNL) to conduct a water aging study that will help improve the understanding of how the MVGB functions. The LLNL study is funded by the GAMA Special Studies Program. Results of the LLNL study will supplement and validate the DRI integrated Martis Valley surface-groundwater model.

This implementation action encourages the partner agencies to continue to identify opportunities, both within the agencies' operations and by collaborating with State and Federal agencies to improve groundwater quality data collection in the MVGB. Data collected for GMP implementation will be focused on identifying long-term water quality trends as they are related to groundwater use.

3.5.4 Use and consider updating the hydrologic model to improve understanding of groundwater in the MVGB

The implementation action directs the partner agencies to use the groundwater model component of the integrated watershed model (when completed) to improve local hydrogeologic understanding within the MVGB. This may be achieved by revising the future regional groundwater model to include the following:

- Development of a focused MVGB hydrogeologic conceptual model;
- Refinement of the numerical groundwater model grid size and model extent;
- Revisions to numerical groundwater model layering and parameterization to reflect updates in the conceptual model; and,
- Establishment of appropriate stress periods and time scales for transient model simulations.

Incorporation of these revisions to the DRI-developed groundwater model will improve the tool so that it can be used to characterize groundwater flow patterns originating from key recharge zones; to quantify potential impacts on groundwater resources resulting from localized extractions; and to evaluate current and future impacts on base flows within the Truckee River as a result of groundwater pumping within the MVGB.

3.5.5 Seek new tools, technology, and information that may improve the understanding of the water resources in the MVGB and watershed

The partner agencies strive to have the best possible understanding of water resources in the MVGB, and prepare reports on water resources such as urban water management plans, water supply analyses, and water master plans in accordance to State requirements.

This implementation action directs the partner agencies to actively seek out tools, technology, and compiled information in order to improve the understanding of water resources in the MVGB. The agencies will share and compare their water resources planning documents to identify similarities and differences. Additionally the agencies will continue to be proactive in looking for methods, approaches, and analysis that improves understanding of water in the MVGB.

3.5.6 Summary of BMO #5 Actions

Table 3-5 presents a summary of implementation actions to be undertaken by the partner agencies that support BMO #5 including the anticipated schedule of implementation.

Table 3-5. Summary BMO#5 Supporting Implementation Actions

	Description of Action	Implementation Schedule
5-1	Work with State and Federal agencies to attempt to secure funding for expansion of the Partner Agencies monitoring grid	Ongoing
5-2	Maintain relationship with DWR for groundwater monitoring and database management activities	Ongoing
5-3	Identify opportunities for collecting water quality monitoring data	As Available
5-4	Use and consider updating the hydrologic model to improve understanding of groundwater in the MVGB	Ongoing
5-5	Seek new tools, technology, and information that may improve the understanding of the water resources in the MVGB and watershed	Ongoing
5-6	Use the best available data to inform and link agency interdependent planning documents (i.e. urban water management plans, water supply analyses, and water master plans)	Ongoing

3.6 Implementation Actions that Support BMO #6 - Consider the environment and participate in the stewardship of groundwater resources

The partner agencies are dedicated stewards of the Martis Valley groundwater resources. The partner agencies' mission statements reflect the importance of managing their respective agencies in an environmentally sound manner, such as minimizing negative impacts of operations on the environment. This BMO directs the partner agencies to continue their leadership in the stewardship of the groundwater, watershed and natural infrastructure.

3.6.1 Consider local, State, or Federal riparian, surface water, or surface water-groundwater interaction investigations, studies or programs in the MVGB

This implementation action directs the partner agencies to consider existing and future studies and investigations of riparian habitat, surface water, and surface- groundwater interaction investigations. Wetlands and riparian areas play an important role in protecting water quality and reducing adverse water quality impacts (EPA, 2005). This implementation action, while not solely focused on pollution prevention, may address issues with such through traditional point sources and non-point sources. Many pollutants are delivered to surface waters and to groundwater from diffuse sources, such as urban runoff, agricultural runoff, and atmospheric deposition of contaminants. Pollution of surface water can impact groundwater quality and conversely pollution of groundwater can impact surface water. The agencies will evaluate the need to consider studies, guidance documents, and programs that investigate the linkages between ground and surface waters.

3.6.2 Continue support and collaboration with local groups that identify, coordinate, or implement projects that support the overall sustainability of the MVGB

This implementation action directs the partner agencies to support and collaborate with local groups that improve sustainability in the MVGB.

The partner agencies will continue support and collaboration with groups and agency members of the SWG, and through public involvement and outreach, identify additional groups to include in GMP implementation.

3.6.3 Summary of BMO #6 Actions

Table 3-6 presents a summary of implementation actions to be undertaken by the partner agencies that support BMO #3 including the anticipated schedule of implementation.

Table 3-6. Summary BMO#6 Supporting Implementation Actions

Description of Action		Implementation Schedule
6-1	Consider local, State, or Federal riparian, surface water, or surface water-groundwater interaction investigations, studies or programs in the MVGB.	As Needed
6-2	Continue support and collaboration with local groups that identify, coordinate, or implement projects that support the overall sustainability of the MVGB.	Ongoing

Section 4

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Appendix A: Resolutions of Intent to Adopt a Groundwater Management Plan

RESOLUTION NO. 11 - 13 OF THE BOARD OF DIRECTORS OF THE PLACER COUNTY WATER AGENCY DECLARING ITS INTENT TO UPDATE ITS MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN AND ADOPT A STATEMENT OF PUBLIC PARTICIPATION

WHEREAS, one of the responsibilities of Placer County Water Agency (Agency) is to provide for sustainable use of groundwater resources within Placer County; and

WHEREAS, The Agency uses groundwater to serve customers in its Martis Valley water system located near Truckee, California; and

WHEREAS, the Agency adopted its current Martis Valley Groundwater Management Plan on October 6, 1998; and

WHEREAS, the current groundwater management plan allows for periodic updates and advocates working collaboratively with others in Martis Valley; and

WHEREAS, the Agency has established a partnership with Truckee Donner Public Utilities District and Northstar Community Services District to prepare an updated groundwater management plan and develop a groundwater model to reflect current water resources planning in Martis Valley and enhance understanding of the underlying groundwater basin; and

WHEREAS, the Agency intends to prepare, adopt, and implement this updated groundwater management plan in cooperation with the general public and stakeholders;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Placer County Water Agency that:

1. The Board intends to prepare, adopt, and implement an updated Martis Valley Groundwater Management Plan. Among other content, the updated groundwater management plan will include basin management objectives, plan components, and management actions.

2. The Agency further intends to provide for and encourage public/stakeholder involvement in the preparation of this updated groundwater management plan.

The foregoing resolution was duly passed at meeting of the Board of Directors of the Placer County Water Agency held on April 7, 2011, by the following on roll call:

AYES DIRECTORS: Gray Allen, Alex Ferreira, Mike Lee, Ben Mavy, Chairman Lowell Jarvis

NOES DIRECTORS: None

ABSENT DIRECTORS: None

Signed and approved by me after its passage this 7th day of April, 2011.

Lowell M. Jarvis

Chair, Board of Directors
Placer County Water Agency

ATTEST:

Chris Spunck

Clerk, Board of Directors
Placer County Water Agency

z:/ns.martis valley.resolution.vf

N·C·S·D
Northstar Community Services District
908 Northstar Drive, Northstar, CA 96161
P: 530.562.0747 • F: 530.562.1505 • www.northstarcsd.com

BOARD OF DIRECTORS

NORTHSTAR COMMUNITY SERVICES DISTRICT

RESOLUTION NO. 11 - 05

**RESOLUTION OF INTENTION
TO COOPERATE IN THE PREPARATION OF THE UPDATED
MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN
WITH THE PLACER COUNTY WATER AGENCY AND
THE TRUCKEE DONNER PUBLIC UTILITY DISTRICT**

AS A BASIS AND PREMISE for this Resolution, the Board of Directors of NORTHSTAR COMMUNITY SERVICES DISTRICT ("District") finds and states as follows:

The District is a "local agency" as that term is defined in the provisions of the California Water Code relating to adoption of a Groundwater Management Plan ("Plan").

The District uses groundwater resources available in the Martis Valley.

The Placer County Water Agency ("Agency") and Truckee Donner Public Utilities District ("TDPUD") also use water from the same or adjoining groundwater aquifers.

The Agency adopted its current Martis Valley Groundwater Management Plan ("Plan") on October 6, 1998, and the Plan allows for periodic updates and advocates working collaboratively with others with an interest in groundwater resources in the Martis Valley.

The Agency, the District and TDPUD have determined it is in their best interests to, and have established a partnership (1) to develop a groundwater model to reflect current water resources planning and operations in the Martis Valley, (2) to enhance understanding of the underlying groundwater basin, and (3) to prepare an updated Plan and propose it for adoption by all three entities as a joint Plan.

On March 16, 2011 this Board directed that notice be given of its desire to adopt this Resolution of Intention, and such notice has been given as provided by law.

NOW, THEREFORE, the BOARD OF DIRECTORS of the NORTHSTAR COMMUNITY SERVICES DISTRICT does hereby RESOLVE, DETERMINE, and ORDER as follows:

1. The District intends to cooperate with the Agency and TDPUD in the development a groundwater model to reflect current water resources planning and operations in the Martis Valley and an updated Martis Valley Groundwater Management Plan, and to propose the Plan for adoption as a joint Plan within the time provided by law.

2. Among other content, the updated Plan will consider inclusion of basin management objectives, plan components, and management actions.

Together with the Agency and TDPUD, the District further intends to provide for and encourage public involvement in the preparation of the updated Plan.

PASSED AND ADOPTED at a regular meeting of the Board of Directors on April 20, 2011 by the following vote:

AYES:	Evans, Green, Ives, Moll, Seelig
NOES:	None
ABSTAIN:	None
ABSENT:	None

Duane E. Evans, President of the Board

ATTEST:

James Bowling, Assistant Secretary of the Board

Resolution No. 2011 - 01

TRUCKEE DONNER PUBLIC UTILITY DISTRICT DECLARING ITS INTENT TO UPDATE ITS MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN AND ADOPT A STATEMENT OF PUBLIC PARTICIPATION

WHEREAS, groundwater is a valuable natural resource in California and should be managed to ensure both its safe production and its quality; and,

WHEREAS, one of the responsibilities of Truckee Donner Public Utility District (District) is to provide for sustainable use of groundwater resources; and

WHEREAS, the District uses groundwater to serve customers from the Martis Valley water system located near Truckee, California; and

WHEREAS, the District adopted its current Martis Valley Groundwater Management Plan on January 3, 1995; and

WHEREAS, the current groundwater management plan allows for periodic updates and advocates working collaboratively with others in Martis Valley; and

WHEREAS, the District has established a partnership with Northstar Community Services District and Placer County Water Agency to prepare an updated groundwater management plan and develop a groundwater model to reflect current water resources planning in Martis Valley and enhance understanding of the underlying groundwater basin; and

WHEREAS, the District intends to prepare, adopt, and implement this updated groundwater management plan in cooperation with the general public and stakeholders;

WHEREAS, prior to adoption of this resolution, the District has held a public hearing, after publication of notice pursuant to Section 6066 of the Government Code, on whether or not to adopt a resolution for intention to update a groundwater management plan;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Truckee Donner Public Utility District that:

1. The Board intends to prepare, adopt, and implement an updated Martis Valley Groundwater Management Plan. Among other content, the updated groundwater management plan will include basin management objectives, plan components, and management actions.

2. The District further intends to provide for and encourage public/stakeholder involvement in the preparation of this updated groundwater management plan.

PASSED AND ADOPTED by the Board of Directors of the Truckee Donner Public Utility District in a meeting duly called and held within said District on the 6th day of April, 2011.

AYES: Directors Aguera, Bender, Hemig, Hillstrom and Laliotis

NOES: None

ABSTAIN: None

ABSENT: None

TRUCKEE DONNER PUBLIC UTILITY DISTRICT

Jeff Bender, President

ATTEST:

Michael D. Holley, P.E. Clerk of the Board

Agenda Item # 11

TRUCKEE DONNER
Public Utility District

ACTION

To: Board of Directors
From: Steven Poncelet
Date: March 16, 2011
Subject: Consideration of Setting a Public Hearing Date to Begin the Martis Valley Groundwater Management Plan Process

1. WHY THIS MATTER IS BEFORE THE BOARD

The Board is responsible for the long-term stewardship of our water supply. Studying the Martis Valley aquifer and having an up-to-date Groundwater Management Plan are important tools for effective stewardship of our water supply.

2. HISTORY

The District has always been concerned with maintaining long-term water supply and water quality for our community. The Board last adopted a Groundwater Management Plan in 1995. The opportunity exists to both update this document and to greatly improve our understanding of how the aquifer functions. This includes better information on the sustainable yield of the aquifer, how changes in the built environment may be impacting water quality, and how climate change may be impacting our long term water supply and quality.

The Board approved the FY09 budget which included $150,000 for a study of the Martis Valley aquifer and an update of our Groundwater Management Plan. The District was able to partner with Placer County Water Agency (PCWA) and Northstar Community Services District (Northstar CSD) to expand the funding for this effort to a total of $250,000. The Board adopted a Memorandum of Agreement for development of the Martis Valley Groundwater Management Plan and groundwater model with PCWA and Northstar CSD at the July 21, 2010 Board meeting. The agency partners secured an additional approximately $500,000 in grant funding from the Bureau of Reclamation for Desert Research Institute (DRI) modeling services and integration of a climate change model. The total project funding is now approximately $750,000.

In late 2010, PCWA, the lead agency, issued a Request for Proposal to hire a consultant to manage the development of the Martis Valley aquifer model and to develop a Groundwater Management Plan and associated public outreach. At their February 7, 2011 Board meeting, a contract was awarded to Brown and Caldwell, with local Truckee sub-contractor Balanced Hydrologics.

3. NEW INFORMATION

Brown and Caldwell has begun work on the Groundwater Management Plan and associated public outreach. The State of California has specific requirements for the development of Groundwater Management Plans. Included in the State requirements is that the District must hold a public hearing, and adopt a Board Resolution to announce the intention to update the Groundwater Management Plan. The District must also hold a second public hearing, and a Board Resolution to adopt the final Groundwater Management Plan. Staff is recommending that we hold the initial public hearing and that the Board consider adopting a Resolution for the intention to update the Groundwater Management Plan at the April 6, 2011 Board meeting.

Brown and Caldwell is developing a final project workplan and schedule. The development of the Martis Valley aquifer model and Groundwater Management Plan and associated public outreach is expected to take approximately two years. Key next steps include:

- Agency partner kick-off meeting with Brown and Caldwell and DRI on March 21, 2011
- Public notice and hearing on the District's intention to update our Groundwater Management Plan
- Creation of a Stakeholder Working Group which would include a technical advisory committee
- Development of a project website available to the public
- Kick-off of the Martis Valley aquifer modeling effort by DRI

4. FISCAL IMPACT

Sufficient funds exist within the approved FY11 budget for the project.

5. RECOMMENDATION

Authorize staff to:

- Schedule a public hearing for the April 6, 2011 Board meeting
- Advertise a public notice for the public hearing

Steven Poncelet
Public Information & Conservation Manager

Michael D. Holley
General Manager

SIERRA SUN

Serving the Truckee Community since 1869

Nicole

Proof and Statement of Publication

RECEIVED 3/29/11

P.O. Box 1888 Carson City, NV 89702
Phone (775) 881-1201
Fax (775) 887-2408

Account Number: 1066693

Legal Account
Placer County Water Agency
P.O. Box 6570
Auburn, CA 95604
Attn: Nicole Snyder

Rachel Renaud says:
That (s)he is a legal clerk of the **SIERRA SUN**, a newspaper published Wednesday, Friday, Saturday at Truckee, in the State of California.

Martis Valley Groundwater Plan

Ad # 6289415

of which a copy is hereto attached, was published in said newspaper for the full required period of **2 times** commencing on **March 16, 2011,** and ending on **March 23, 2011,** all days inclusive.

Signed: Rachel Renaud

STATEMENT:

DATE	AMOUNT	CREDIT	BALANCE
3/23/11	$135.26	$ 0.00	$135.26

NOTICE OF PLACER COUNTY WATER AGENCY BOARD OF DIRECTORS MEETING AGENDA ITEM FOR RESOLUTION OF INTENT TO UPDATE ITS MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that the Placer County Water Agency (PCWA) will hold a public hearing in accordance with California Water Code Section 10753.2 to review and consider a Resolution of Intent to update its Martis Valley Groundwater Management Plan. The public hearing will be held April 7, 2011 at 2:00 p.m. at the regularly scheduled meeting of the PCWA Board of Directors which is held in the American River Room at its Business Center, 144 Ferguson Road, Auburn, California. The public is invited to comment on PCWA's intent as described.

The reasons for updating the Martis Valley Groundwater Management Plan are to reflect current water resources planning in the region, to reflect the latest information and understandings of the underlying groundwater basin, and to update the plan in partnership with adjacent water purveyors in an effort to work collaboratively and align policy. The plan will be updated in partnership with Truckee Donner Public Utilities District and Northstar Community Services District. In addition to updating the groundwater management plan, a computer model of the groundwater basin will be developed, which will assimilate available data and enhance understanding of the basin.

PCWA and its partners intend to prepare, adopt, and implement this updated groundwater management plan in cooperation with the general public and stakeholders. For more information please contact Tony Firenzi at (530) 823-4886 or tfirenzi@pcwa.net.

Pub: March 16, 23, 2011 Ad#6289415

SIERRA SUN

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POWA
FINANCE

Proof and RECEIVED 4/28/11
Statement of Publication

P.O. Box 1888 Carson City, NV 89702 2011 APR 25 PM 1 16
Phone (775) 881-1201
Fax (775) 887-2408

Account Number: 1066693

Legal Account
Placer County Water Agency
P.O. Box 6570
Auburn, CA 95604
Attn: Nicole Snyder

Rachel Renaud says:
That (s)he is a legal clerk of the **SIERRA SUN**, a newspaper published Wednesday, Friday, Saturday at Truckee, in the State of California.

Martis Valley Groundwater Management Plan

Ad # 6400246

of which a copy is hereto attached, was published in said newspaper for the full required period of **2 times** commencing on **April 13, 2011,** and ending on **April 20, 2011,** all days inclusive.

Signed: Rachel Renaud

STATEMENT:

DATE	AMOUNT	CREDIT	BALANCE
4/20/11	$226.63	$ 0.00	$226.63

RESOLUTION NO. 11 -13 OF THE BOARD OF DIRECTORS OF THE PLACER COUNTY WATER AGENCY DECLARING ITS INTENT TO UPDATE ITS MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN AND ADOPT A STATEMENT OF PUBLIC PARTICIPATION

WHEREAS, one of the responsibilities of Placer County Water Agency (Agency) is to provide for sustainable use of groundwater resources within Placer County; and

WHEREAS, The Agency uses groundwater to serve customers in its Martis Valley water system located near Truckee, California; and

WHEREAS, the Agency adopted its current Martis Valley Groundwater Management Plan on October 6, 1998; and

WHEREAS, the current groundwater management plan allows for periodic updates and advocates working collaboratively with others in Martis Valley; and

WHEREAS, the Agency has established a partnership with Truckee Donner Public Utilities District and Northstar Community Services District to prepare an updated groundwater management plan and develop a groundwater model to reflect current water resources planning in Martis Valley and enhance understanding of the underlying groundwater basin; and

WHEREAS, the Agency intends to prepare, adopt, and implement this updated groundwater management plan in cooperation with the general public and stakeholders;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Placer County Water Agency that:

1. The Board intends to prepare, adopt, and implement an updated Martis Valley Groundwater Management Plan. Among other content, the updated groundwater management plan will include basin management objectives, plan components, and management actions.
2. The Agency further intends to provide for and encourage public/stakeholder involvement in the preparation of this updated groundwater management plan.

The foregoing resolution was duly passed at meeting of the Board of Directors of the Placer County Water Agency held on April 7, 2011, by the following on roll call:

AYES DIRECTORS: Gray Allen, Alex Ferreira, Mike Lee, Ben Mavy, Chairman Lowell Jarvis

NOES DIRECTORS: None

ABSENT DIRECTORS: None

Signed and approved by me after it passage this 7th day of April, 2011

/s/ Lowell M. Jarvis
Chair, Board of Directors
Placer County Water Agency

ATTEST:
/s/ Cheri Sprunck
Clerk, Board of Directors
Placer County Water Agency

Pub: April 13, 20, 2011 Ad#6400246

16391896

PUBLIC NOTICE

16391896

PUBLIC NOTICE

NOTICE OF PLACER COUNTY WATER AGENCY BOARD OF DIRECTORS MEETING AGENDA ITEM FOR RESOLUTION OF INTENT TO UPDATE ITS MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN

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The reasons for updating the Martis Valley Groundwater Management Plan are to reflect current water resources planning in the region, to reflect the latest information and understandings of the underlying groundwater basin, and to update the plan in partnership with adjacent water purveyors in an effort to work collaboratively and align policy. The plan will be updated in partnership with Truckee Donner Public Utilities District and Northstar Community Services District. In addition to updating the groundwater management plan, a computer model of the groundwater basin will be developed, which will assimilate available data and enhance understanding of the basin.

PCWA and its partners intend to prepare, adopt, and implement this updated groundwater management plan in cooperation with the general public and stakeholders. For more information please contact Tony Firenzi at (530) 823-4886 or tfirenzi@pcwa.net.

PUBLISHED IN AUBURN JOURNAL: MARCH 16, 23, 2011

The above space is reserved for Court/County Filed Date Stamp

PROOF OF PUBLICATION (2015.5 C.C.P.)

STATE OF CALIFORNIA
County of Placer

I am a citizen of the United States and employed by a publication in the County aforesaid. I am over the age of eighteen years, and not a party to the mentioned matter. I am the principal clerk of **The Auburn Journal**, a newspaper of general circulation, in the **City of Auburn**, which is printed and published in the **County of Placer**. This newspaper has been judged a newspaper of general circulation by the Superior Court of the State of California, in and for the **County of Placer**, on the date of May 26, 1952 (Case Number 17407). The notice, of which the attached is a printed copy (set in type not smaller than nonpareil) has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

MARCH 16, 23

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

Terry Clark

Terry Clark

Dated in Auburn, California

MARCH 23, 2011

PROOF OF PUBLICATION
THE AUBURN JOURNAL
1030 High Street
Auburn, CA 95604-5910

16395813

PUBLIC NOTICE

16395813

PUBLIC NOTICE

RESOLUTION NO. 11 - 13 OF THE BOARD OF DIRECTORS OF THE PLACER COUNTY WATER AGENCY DECLARING ITS INTENT TO UPDATE ITS MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN AND ADOPT A STATEMENT OF PUBLIC PARTICIPATION

WHEREAS, one of the responsibilities of Placer County Water Agency (Agency) is to provide for sustainable use of groundwater resources within Placer County; and

WHEREAS, The Agency uses groundwater to serve customers in its Martis Valley water system located near Truckee, California; and

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2. The Agency further intends to provide for and encourage public/stakeholder involvement in the preparation of this updated groundwater management plan.

The foregoing resolution was duly passed at meeting of the Board of Directors of the,
Placer County Water Agency held on April 7, 2011, by the following on roll call:

AYES DIRECTORS: Gray Allen, Alex Ferreira, Mike Lee, Ben Mavy, Chairman Lowell Jarvis

NOES DIRECTORS: None

ABSENT DIRECTORS: None

Signed and approved by me after its passage this 7th day of April, 2011.

PUBLISHED IN AUBURN JOURNAL: APRIL 13, 20, 2011

A/P Has Original

The above space is reserved for Court/County Filed Date Stamp

PROOF OF PUBLICATION (2015.5 C.C.P.)

STATE OF CALIFORNIA
County of Placer

I am a citizen of the United States and employed by a publication in the County aforesaid. I am over the age of eighteen years, and not a party to the mentioned matter. I am the principal clerk of **The Lincoln News Messenger**, a newspaper of general circulation, in the **City of Lincoln**, which is printed and published in the **County of Placer.** This newspaper has been judged a newspaper of general circulation by the Superior Court of the State of California, in and for the **County of Placer**, on the date of April 3, 1952, Superior Court Order Number 89429. The notice, of which the attached is a printed copy (set in type not smaller than nonpareil) has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

APRIL 13, 20

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

Terry Clark

Dated in Lincoln, California

APRIL 20, 2011

PROOF OF PUBLICATION
THE LINCOLN NEWS MESSENGER
553 F Street
Lincoln, CA 95648

N·C·S·D
Northstar Community Services District
908 Northstar Drive, Northstar, CA 96161
P: 530.562.0747 • F: 530.562.1505 • www.northstarcsd.com

NORTHSTAR COMMUNITY SERVICES DISTRICT
NOTICE OF THE REGULAR MEETING
OF THE BOARD OF DIRECTORS

DATE: **MARCH 16, 2011**
TIME: **9 A.M.**
PLACE: **NORTHSTAR FIRE STATION, 910 NORTHSTAR DRIVE**

I. CALL TO ORDER, PLEDGE OF ALLEGIANCE, ROLL CALL

II. PUBLIC COMMENTS

Any member of the public may address the Board after roll call on any topic related to the District that is not on the agenda. Public comment will be taken on agenda action items immediately prior to Board action.

III. RECURRING BUSINESS

1. Approval and Discussion of the minutes of the February 15, 2011 Finance Committee Meeting and the February 16, 2011 Regular Meeting.
2. Meetings attended by NCSD Board Members – Discussion.

IV. NEW BUSINESS

3. East West Partners – Update.
4. Northstar Property Owners Association – Update.
5. CAMCO – Update.
6. Northstar-at-Tahoe/Vail – Update.
7. Martis Valley Groundwater Management Plan – Action to set Public Hearing on Resolution of Intention to cooperate in the preparation of the Martis Valley Groundwater Management Plan – Discussion – Action.
8. Resolution 11-03 "Resolution Approving the Department of Forestry and Fire Protection Agreement for Services from July 1, 2010 to June 30, 2013" – Discussion – Action.
9. Approval of Shift Proposal for Strategic Communications and Community Engagement Strategies – Martis Valley Regional Trail – Discussion – Action.
10. Approval of Memorandum of Agreement Between the North Lake Tahoe Resort Association and the Northstar Community Services District for use of Transient Occupancy Tax (TOT) Infrastructure Funds – Discussion – Action.
11. Approval of Exempt Employee Flexible Work Schedule Policy – Discussion – Action.

V. ATTORNEYS REPORT

VI. CLOSED SESSION

12. Conference with Legal Counsel – Existing Litigation [California Government Code Section 54956.9(a)]; Two cases: 1) Name of Case: *Community Facilities District #1 of the Northstar Community Services District vs. Highlands Hotel Residences Company, LLC, Bank of America, et al*, Placer County, California Superior Court #SCV0027907. 2) Name of Case: *Bank of America & Thomas Morone, as Receiver for Highlands Hotel Company vs. NCSD & Community Facilities District No. 1 of NCSD*, Placer County, California Superior Court #SCV0028495.

13. Public Employee Performance Evaluation (Government Code Section 54957) – Titles: Engineering and Mapping Department: Information Systems Supervisor, Director of Public Works, Associate Engineer, GIS Analyst – Administration Department: Controller, Administrative Manager, Administrative Assistant, Human Resource Director
14. Conference with Labor Negotiators (Government Code §54957.6) – Agency designated representatives: Jim Bowling, Mark Shadowens. Employee organization: Employee Representation – Fire Department employees.

VII. DIRECTOR REPORTS

Individual directors may give brief reports on miscellaneous items for the information of the other members of the board and NCSD staff. No action will be taken.

VIII. OPERATION REPORTS

15. General Managers Report – Staudenmayer – Discussion.
16. Fire Department Report – Shadowens – Discussion.
17. Director of Public Works Report – Geary – Discussion.
18. Utilities Department Report – Ryan – Discussion.
19. Administration Department Report – Tanner/Lewis/Bowling – Discussion.

IX. WARRANT REGISTER & MELLO-ROOS REQUISITIONS

20. Approval of the Warrant Register.
21. Ratification of Mello-Roos Requisitions in the amount of $15,353.42.

X. ADJOURNMENT

Items may not be taken in the order listed above.

In compliance with the Americans with Disabilities Act, if you are a disabled person and you need a disability-related modification or accommodation to participate in this meeting, then please contact Myra Tanner at (530) 562-0747 or (530) 562-1505 (fax). Requests must be made as early as possible and at least one-full business day before the start of the meeting.

Appendix B: Resolutions Adopting the Groundwater Management Plan

SIERRA SUN

P.O. Box 1888 Carson City, NV 89702
(775) 881-1201 FAX: (775) 887-2408

Customer Account: # 1073085

Legal Account
Placer County Water Agency
P.O. Box 6570
AUBURN, CA 95604
Attn: Vibeke Figueroa

Victoria Lopez says:
That (s)he is a legal clerk of the **SIERRA SUN**, a newspaper published Wednesday and Friday at Truckee, in the State of California.

Copy Line
Joint Martis Valley

PO#:

Ad #: 8823943D
of which a copy is hereto attached, was published in said newspaper for the full required period of **2** time(s) commencing on **1/23/2013**, and ending on **1/30/2013**, all days inclusive.

Signed:______________________

Date: 01/31/2013 State of Nevada, Carson City

Price: $ 235.980

Subscribed and sworn to before me this ____ day of ______

____
Notary Public

Proof and Statement of Publication

Ad #: 8823943D

PUBLIC HEARINGS

NOTICE OF TRUCKEE DONNER PUBLIC UTILITIES DISTRICT BOARD OF DIRECTORS
NOTICE OF NORTHSTAR COMMUNITY SERVICES DISTRICT BOARD OF DIRECTORS
NOTICE OF PLACER COUNTY WATER AGENCY BOARD OF DIRECTORS
MEETING AGENDA ITEMS TO ADOPT THE MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN

Truckee Donner Public Utility District (TDPUD), Northstar Community Services District (NCSD) and Placer County Water Agency (PCWA) will hold their individual public hearings in accordance with California Water Code Section 10753.2 to review and consider adoption of the Martis Valley Groundwater Management Plan. The respective public hearings are scheduled accordingly:

- The TDPUD public hearing will be held February 20, 2013 at 6:00 PM at the regularly scheduled meeting of the TDPUD Board of Directors located at 11570 Donner Pass Road, Truckee, California.
- The NCSD public hearing will be held February 20, 2013 at 9:00 AM at the regularly scheduled meeting of the NCSD Board of Directors located at the Northstar Fire Station located at 910 Northstar Drive, Northstar, California.
- The PCWA public hearing will be held February 21, 2013 at 2:00 PM, at the regularly scheduled meeting of the PCWA Board of Directors, which is held in the American River Room at its Business Center, 144 Ferguson Road, Auburn, California.

The public is invited to comment on the partner Agencies' intent as described.

The reasons for updating the Martis Valley Groundwater Management Plan are to reflect current water resources planning in the region, to reflect the latest information and understandings of the underlying groundwater basin, and to update the plan in partnership with TDPUD, NCSD and PCWA in an effort to promote regional water management, work collaboratively, and align policy. The plan document includes management objectives and actions that support long term quality and availability of groundwater in the Martis Valley Groundwater Basin. In addition to updating the groundwater management plan, a Bureau of Reclamation-sponsored computer model of the Martis Valley groundwater basin and watershed is currently being developed by the Desert Research Institute, which provided preliminary groundwater recharge estimates of the Martis Valley groundwater basin and will ultimately enhance understanding of basin groundwater resources.

Copies of the draft Martis Valley Groundwater Management Plan are available for public review and comment at the respective agency offices or at www.MartisValleyGMP.org. Printed copies may be obtained for the cost of reproduction. The three partners intend to adopt and implement this updated groundwater management plan in cooperation with the general public and stakeholders. For more information please contact Barbara Cahill at (530) 582-3909 or barbaracahill@tdpud.org ; Mike Staudenmayer (NCSD) at (530) 562-0747 or mikes@northstarcsd.com ; or Tony Firenzi (PCWA) at (530) 823-4886 or tfirenzi@pcwa.net. Any comments or protests by landowners in the plan area must be submitted prior to the close of public comment at any of the three hearings listed above.

Pub: January 23, 30, 2013 **Ad#8823943**

16489006

PUBLIC HEARINGS

16489006

PUBLIC HEARINGS

NOTICE OF TRUCKEE DONNER PUBLIC UTILITIES DISTRICT BOARD OF DIRECTORS NOTICE OF NORTHSTAR COMMUNITY SERVICES DISTRICT BOARD OF DIRECTORS NOTICE OF PLACER COUNTY WATER AGENCY BOARD OF DIRECTORS MEETING AGENDA ITEMS TO ADOPT THE MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN

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PUBLISHED IN AUBURN JOURNAL: JANUARY 23, 30, 2013

The above space is reserved for Court/County Filed Date Stamp

PROOF OF PUBLICATION (2015.5 C.C.P.)

STATE OF CALIFORNIA
County of Placer

I am a citizen of the United States and employed by a publication in the County aforesaid. I am over the age of eighteen years, and not a party to the mentioned matter. I am the principal clerk of **The Auburn Journal**, a newspaper of general circulation, in the **City of Auburn**, which is printed and published in the **County of Placer**. This newspaper has been judged a newspaper of general circulation by the Superior Court of the State of California, in and for the **County of Placer**, on the date of May 26, 1952 (Case Number 17407). The notice, of which the attached is a printed copy (set in type not smaller than nonpareil) has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

JANUARY 23, 30

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

Terry Clark

Terry Clark

Dated in Auburn, California

JANUARAY 30, 2013

PROOF OF PUBLICATION
THE AUBURN JOURNAL
1030 High Street
Auburn, CA 95604-5910

N•C•S•D
Northstar Community Services District
908 Northstar Drive, Northstar, CA 96161
P: 530.562.0747 • F: 530.562.1505 • www.northstarcsd.org

BOARD OF DIRECTORS
NORTHSTAR COMMUNITY SERVICES DISTRICT

RESOLUTION 13-01

RESOLUTION OF THE BOARD OF DIRECTORS OF THE NORTHSTAR COMMUNITY SERVICES DISTRICT ADOPTING THE MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN

WHEREAS, On April 20, 2011 the Board of Directors passed Resolution 11-05 "Resolution of Intention to Cooperate in the Preparation of the Updated Martis Valley Groundwater Management Plan with the Placer County Water Agency and the Truckee Donner Public Utility District and adopt a statement of public involvement; and

WHEREAS, the District prepared an updated plan in partnership with the Truckee Donner Public Utilities District and the Placer County Water Agency (PCWA) in an effort to work collaboratively and align policy; and

WHEREAS, the updated Martis Valley Groundwater Management Plan was prepared in accordance with the California Groundwater Management Act, Assembly Bill 3030, and Senate Bill 1938; and

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors of the Northstar Community Services District hereby adopts the updated Martis Valley Groundwater Management Plan.

PASSED AND ADOPTED by the Northstar Community Services District this 20th day of February, 2013, by the following vote on call:

AYES:	**Green, Ives, Seelig, Smith**
NOES:	**None**
ABSENT:	**None**
ABSTAIN:	**Evans**

Nancy P. Ives
President of the Board

ATTEST:

James Bowling
Secretary of the Board

RESOLUTION NO. 13-03 OF THE BOARD OF DIRECTORS OF THE PLACER COUNTY WATER AGENCY ADOPTING THE UPDATED MARTIS VALLEY GROUNDWATER MANAGEMENT PLAN

WHEREAS, On April 7, 2011 the Board of Directors passed Resolution 11-13 declaring its intent to update its Martis Valley Groundwater Management Plan and adopt a statement of public involvement; and

WHEREAS, the Agency prepared an updated plan in partnership with the Truckee Donner Public Utilities District and the Northstar Community Services District in an effort to work collaboratively and align policy; and

WHEREAS, the updated Martis Valley Groundwater Management Plan was prepared in accordance with the California Groundwater Management Act, Assembly Bill 3030, and Senate Bill 1938; and

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors of the Placer County Water Agency hereby adopts the updated Martis Valley Groundwater Management Plan.

The foregoing resolution was duly passed at meeting of the Board of Directors of the Placer County Water Agency held on February 21, 2013, by the following on roll call:

AYES DIRECTORS: Joshua Alpine, Robert Dugan, Alex Ferreira, Mike Lee, Chair Gray Allen

NOES DIRECTORS: None

ABSENT DIRECTORS: None

Signed and approved by me after its passage this 21st day of February, 2013.

Graham L Allen

Chair, Board of Directors
Placer County Water Agency

ATTEST:

Cheri Sprunck

Clerk, Board of Directors
Placer County Water Agency

Resolution No. 2013 – 04

Adopt the Martis Valley Groundwater Management Plan

WHEREAS, groundwater is a valuable natural resource in California and should be managed to ensure both its safe production and its quality; and,

WHEREAS, one of the responsibilities of Truckee Donner Public Utility District (District) is to provide for sustainable use of groundwater resources; and

WHEREAS, the District uses groundwater to serve customers from the Martis Valley water system located near Truckee, California; and

WHEREAS, the District adopted its current Martis Valley Groundwater Management Plan on January 3, 1995; and

WHEREAS, on April 8, 2011, the Board of Directors passed Resolution 2011-01 declaring its intent to update its Martis Valley Groundwater Management Plan and adopt a statement of public involvement; and

WHEREAS, the District prepared an updated plan in partnership with the Placer County Water Agency and the Northstar Community Services District in an effort to work collaboratively and align policy; and

WHEREAS, the updated Martis Valley Groundwater Management Plan was prepared in accordance with the California Groundwater Management Act, Assembly Bill 3030, and Senate Bill 1938.

NOW, THEREFORE, BE IT RESOLVED that the Board of Directors of the Truckee Donner Public Utility District hereby adopts the updated Martis Valley Groundwater Management Plan.

The foregoing resolution was duly passed at a meeting of the Board of Directors of Truckee Donner Public Utility District held on February 20, 2013, by the following roll call:

AYES: Directors Bender, Ellis, Hemig and Laliotis
NOES: None
ABSTAIN: None
ABSENT: Director Aguera

TRUCKEE DONNER PUBLIC UTILITY DISTRICT

Jeff Bender, President

ATTEST:

Michael D. Holley, District Clerk

Appendix C: Public Outreach Plan

Brown AND Caldwell

10540 White Rock Road, Suite 180
Rancho Cordova, CA 95670
Tel: 916-444-0123
Fax: 916-635-8805

Technical Memorandum

Project Title: Martis Valley Groundwater Management Plan

Project No: 140691

Public Outreach Plan Technical Memorandum (Deliverable Task 1.2)

Date: May 25, 2011

To: Tony Firenzi, Brian Martin, Michael Holley, Steven Poncelet, and Mike Staudenmayer

From: Tina Bauer, Project Manager

Prepared by: John Ayres

John Ayres, Task One Manager

Reviewed by: Tina M Bauer

Tina M. Bauer, Project Manager

Introduction

The partnership of Placer County Water Agency (PCWA), Truckee Donner Public Utilities District (TDPUD), and Northstar Community Services District (NCSD), herein referred to as the partnership agencies, are working together to update a Groundwater Management Plan (GMP) for the Martis Valley in accordance with the California Water Code, Article 107050. The overall goal of the GMP is to develop a framework that maintains groundwater quantity and quality, thereby providing a sustainable, high-quality supply for beneficial use in the Martis Valley. Brown and Caldwell (BC) has been contracted by the partnership to prepare the GMP and perform public outreach activities.

The reasons for updating the Martis Valley GMP are to:

- Reflect current water resources planning in the region,
- Update the understanding of the underlying groundwater basin, and
- Prepare the plan in partnership with basin water purveyors in an effort to work collaboratively and align policy.

In addition to updating the GMP a computer model of the groundwater basin will be developed by the Desert Research Institute (through a grant from the Bureau of Reclamation) which will assimilate available data and enhance the understanding of the basin. This groundwater model will be used as a tool to improve basin understanding during GMP development.

Public outreach as described herein is a key component of the process in preparing the GMP.

Public Outreach Objectives

This plan's outreach activities are designed to meet the following outreach objectives:

- Inform the public regarding the development of the GMP.
- Provide meaningful opportunities for stakeholders and the general public to contribute to the development of the GMP.
- Incorporate stakeholder input regarding the GMP.
- Document stakeholder recommendations in a clear, complete manner.
- Develop public understanding and support of the GMP.

To pursue these objectives effectively, various outreach methods will be necessary to reach the groups targeted for inclusion in the planning process.

Groundwater Management Plan Preparation

During the course of preparing the GMP, various entities will be involved in developing, approving, and adopting the GMP. Their roles and responsibilities are as follows:

Partnership Agencies – Each individual agency will follow the GMP adoption process. As such, each agency will conduct two public hearings. The first hearing will be to adopt a resolution of intent to prepare a GMP and the second hearing will be to determine whether or not to adopt the GMP. These hearings will be conducted in compliance with the California Water Code, Article 10753.2 through Article 10753.6. Hearings were held by each agency in April 2011 to indicate to the public the intent of the agencies to develop a GMP. The public was notified in advance in accordance with the California Water Code.

Groundwater Management Plan Team – The GMP team consists of the partnership agencies, BC, and BC's subcontractor, Balance Hydrologics, Inc of Truckee, Ca. Brown and Caldwell will perform the majority of the technical work and analyses, conduct and document the public outreach effort, conduct public meetings and SWG meetings, develop and maintain a website so that information on the project is available to interested parties, and prepare newsletters and notifications of meetings and events. The partnership agencies will provide available resource data, GIS information, and review BC's work. The partnership agencies will provide the names and addresses of special interest groups and interested public members, and assist in distributing newsletters and notifications of meetings and events through the media. The Partnership Agencies will also provide available data and information related to land and water use policies and ordinances affecting water management in Martis Valley.

Stakeholder Working Group – The Stakeholder Working Group (SWG) will be comprised of representatives of federal, state, and local governments, environmental and special interest groups, local land use interests, and the general public selected by the partnership agencies. The SWG will provide local knowledge, data and information, opinions, and review and comment on material prepared by the GMP team. Five meetings with the SWG are anticipated to occur at strategic times for addressing particular items, as appropriate.

General Public – The public will be invited to participate in two public hearings for each partnership agency and two public workshops. The first workshop will explain the process of GMP development and present groundwater model concepts (July 2011). The second workshop will be conducted near project completion and will provide an overview of GMP content. The first agency public hearings have been completed. The second agency public hearings will be conducted at project completion (anticipated November 2012). All agency public hearings will be in compliance with the California Water Code, Article 107050.

Communications and Notifications

Communication and notification is an important aspect of effective outreach. Various means of communication and notification will be utilized to implement this Public Outreach Plan including the following:

Notifications - Notifications are the primary method of outreach used to inform the public of upcoming meetings and hearings. Notifications will be published in the Sierra Sun and the Auburn Journal and will be prepared and submitted to the review group approximately one week prior to the planned publication date.

Website - During project implementation, a public website will be developed and hosted. The website will also contain basic information about the project, including project goals, sponsoring agencies, and who to contact for more information. The website will be updated monthly to supply regular information updates to the public about project progress, data gathered, and decisions made. The website will have pages dedicated to GMP development, groundwater model development, and a page that provides notices, newsletters, and quarterly reports.

Mailing/Contact List - A list of the names and addresses of participants and interested parties will be created by BC and used for communicating information regarding meetings and materials related to the GMP.

Newsletters - Public outreach will include three newsletters. Newsletters will consist of a double-sided full page color flyer that provides basic information about the project including the project goal, sponsoring agencies, and who to contact for more information. Each newsletter will address specific components of the project. The newsletters will be distributed at each partnership agency office and be uploaded onto the website.

Public Workshops, Public Hearings, and SWG Meetings

An important part of the public outreach will be the communications provided by the GMP team and comments provided by those participating in a particular forum. In general, the framework for the various forums conducted by Brown and Caldwell will be as described below. The timing for conducting the respective forums is shown on attached Table 1. Communications and notifications will be made in advance of each forum using the means noted.

Public Workshops – Two public workshops will be conducted. The 1st public workshop will be held to explain the process of GMP and model development to the public. This goal of this workshop is to inform the public of the purpose of the GMP and expected outcomes of GMP and model development. The second public workshop will provide an overview of GMP content and present groundwater modeling results. The goal of this workshop is to build public support of the GMP and model. Public workshops will be held using an open format, with presenters at multiple stations in different parts of the meeting room. Each presenter will be focused on a specific component of project development, and will have visual materials with them to facilitate explanation of the subject matter. Meeting participants will move from station to station according to their interests and time constraints.

Public Hearings – Two public hearings are required to adopt a GMP in compliance with the California Water Code, Article 17050. The first public hearing is conducted to adopt a resolution of intent to prepare a GMP and the second public hearing will be conducted to determine whether or not to adopt the GMP. Hearings were held by each partnership agency in April, 2011 to indicate to the public the intent of the agencies to develop a GMP.

Stakeholder Working Group Meetings – During the course of the project, meetings will be held with the partnership agencies and the SWG. All meetings will have an agenda and PowerPoint presentation with copies of pertinent information, as appropriate. Notes of the meetings will be prepared to document the salient items discussed. The anticipated content of the SWG meetings are as follows:

- The 1st SWG meeting will be held to introduce SWG members to the project and solicit their involvement. Presentation materials will include an overview of GMP content, discussion of the GMP's relationship with the groundwater model, and discussion of SWG member's local knowledge and the SWG's role during GMP development.
- The 2nd SWG meeting will present the conceptual model and physical conditions of the groundwater basin to SWG members. The physical conditions of the Martis Valley groundwater basin will be presented, including cross sections, monitoring well hydrographs, and other information as appropriate. The goal of this meeting is form consensus on what groundwater resources are present in the basin to be managed by the GMP.
- The 3rd SWG meeting will present preliminary GMP goals and management objectives for comment and suggestions to SWG members. The goal of this meeting is to build consensus about the identified goal and management objectives of the GMP.
- The 4th SWG meeting will present preliminary implementation actions and implementation schedule to the SWG for comment and suggestions. The goal of this meeting is to fully identify implementation actions for the GMP.
- The goal of the 5th SWG meeting is to discuss steps taken after adoption of the GWMP.

Summary of Opportunities for Public Participation

The partnership agencies are providing numerous opportunities for the public to participate in and to stay informed throughout the GMP planning process. A summary of the opportunities noted above with the anticipated timing of the event, as shown on the Outreach Activity Schedule, include the following:

- Partnership agency meetings and public hearings.
- Public Workshops.

In addition, a website will be available to the public to facilitate being informed of meeting dates, draft documents, notices, newsletters, and contact information.

		2011										2012													
	Outreach Activity	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
1	Hearing to Adopt Intent to Develop GMP		□																						
2	Agency Meetings		▩				▩		▩				▩			▩		▩			▩				
3	Public Outreach pPlan			☆																					
4	Website and Monthly Updates			✪	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★	★
5	Stakeholder Working Group Meeting		■																						
6	Public Workshop					□																			
7	Stakeholder Working Group Meeting						■																		
8	Newsletter							▤																	
9	Stakeholder Working Group Meeting												■												
10	Stakeholder Working Group Meeting														■										
11	Newsletter															▤									
12	Newsletter																		▤						
13	Public Workshop																		□						
14	Stakeholder Working Group Meeting																			■					
15	Hearing to Adopt GMP																					□			

KEY

Client Agencies Meeting	▩
Stakeholder Group Meeting	■
Public Meeting or Hearing	□
Public Outreach Plan	☆
Website Live	✪
Website update	★
Newsletter	▤

Table 1 Outreach Schedule

Appendix D: CASGEM Monitoring Plan

Martis Valley Groundwater Monitoring Program

California Statewide Groundwater Elevation Monitoring (CASGEM)

Placer County Water Agency	Truckee Donner Public Utilities District	Northstar Community Services District

December 2011

Revised July 12, 2012

TABLE OF CONTENTS

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3.0 MONITORING NETWORK 3-1

4.0 MONITORING EQUIPMENT AND PREPARATION 4-1

5.0 DEPTH-TO-GROUNDWATER PROCEDURES AND FREQUENCY OF MONITORING AND REPORTING 5-1

6.0 RECORDING OF MONITORING DATA, DATA MANAGEMENT AND THE CASGEM REQUIREMENTS 6-1

APPENDICES

Appendix A – CASGEM Guidelines
Appendix B – CASGEM Monitoring Plan Summary

1.0 INTRODUCTION

This Martis Valley (MV) Groundwater Monitoring Program (Monitoring Program) report serves to describe the activities related to the monitoring of groundwater elevations in the MV area, as shown on **Figure 1-1**.

The elevation data gathered as part of this program will be included as part of the California Statewide Groundwater Elevation Monitoring (CASGEM) Program recently adopted by the California Department of Water Resources (DWR) as part of their mandated monitoring requirements under Senate Bill (SB) 6[1] of the State Water Code. This report strongly encourages the reader to review and understand the full text of the CASGEM Well Monitoring Guidelines, attached as **Appendix A**.

This Monitoring Program pulls together the efforts completed to date in the identification of existing and future well monitoring sites that satisfy the local and state requirements for a monitored groundwater basin. In addition, the Monitoring Program prepares the MV groundwater users to initiate a semi-annual monitoring event, which started with its first measurements in fall of 2011. Placer County Water Agency (PCWA), Truckee Donner Public Utilities District (TDPUD), and Northstar Community Services District (NCSD) are the three partners in MV area, in which their respective services areas are presented in Figure 1-1.

All field forms and measurement methods are included herein for the sole purpose of providing monitoring staff with easy access to printing and using these forms as part of their monitoring activities. The MV Monitoring Program report is a living document subject to change over time as more information is collected on the wells, and as technologies change to provide the best measurement of groundwater levels and water quality, and as more wells become available.

[1] SB 6 requires collaboration between local monitoring parties, or entities, and DWR to collect groundwater elevations statewide and that this information is made available to the public. SB 6 provides that:

- Local parties may assume responsibility for monitoring and reporting groundwater elevations.
- DWR work cooperatively with local Monitoring Entities to achieve monitoring programs that demonstrate seasonal and long-term trends in groundwater elevations.
- DWR accept and review prospective Monitoring Entity submittals, then determine the designated Monitoring Entity, notify the Monitoring Entity, and make that information available to the public.
- DWR perform groundwater elevation monitoring in basins where no local party has agreed to perform the monitoring functions.
- If local parties (for example, counties) do not volunteer to perform the groundwater monitoring functions, and DWR assumes those functions, then those parties become ineligible for water grants or loans from the State.

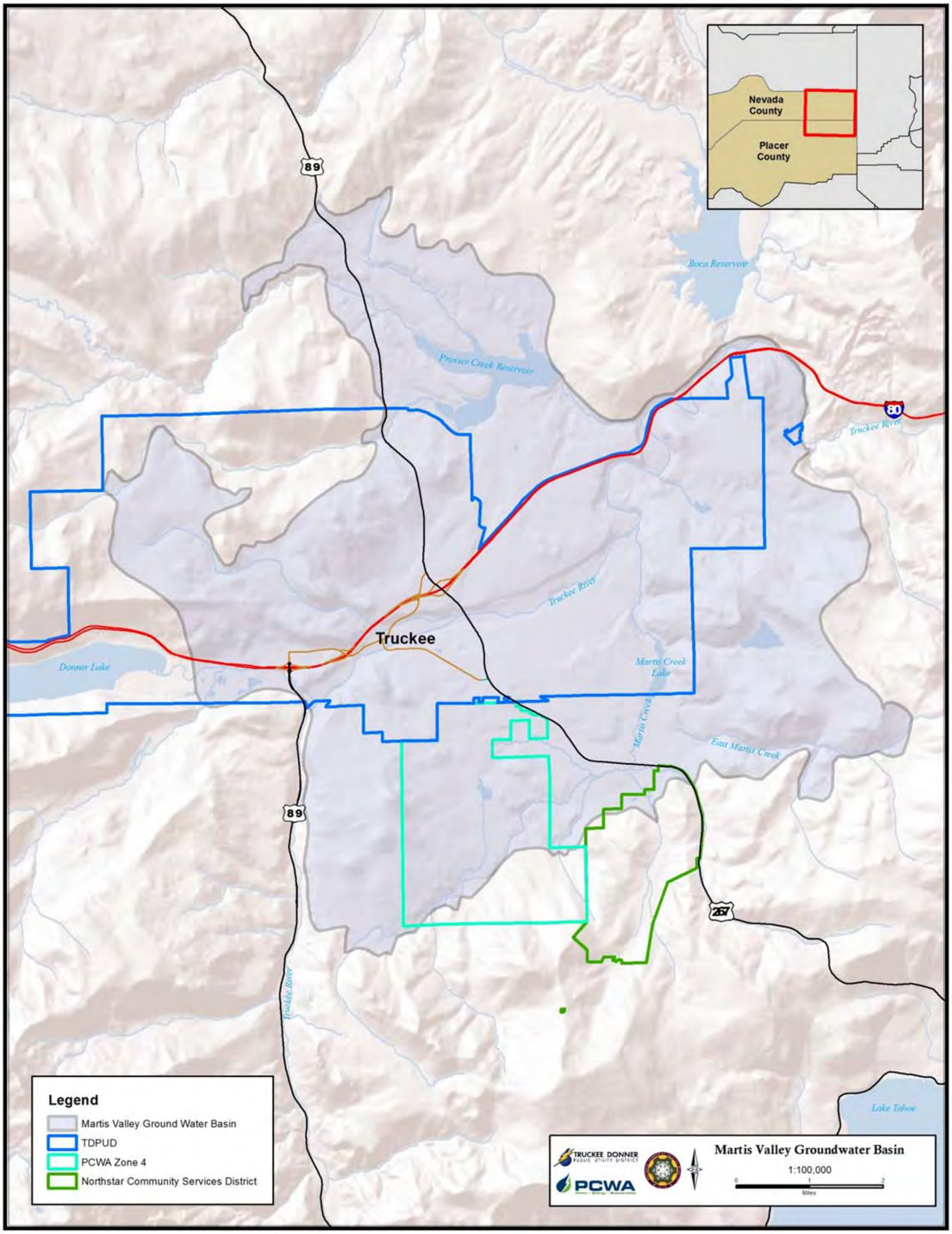

FIGURE 1-1. MAP OF GROUNDWATER BASIN TO BE MONITORED

1.1 ORGANIZATION OF REPORT

The Monitoring Program will be described in the sections summarized below:

- **Section 1. Introduction –** An initial summary of the report's contents and goals while highlighting the reasons for the Monitoring Program.

- **Section 2. Background –** A brief understanding of the groundwater aquifer is provided to ensure a minimum level of understanding by field staff of the conditions taking place below the ground.

- **Section 3. Monitoring Network –** Criteria for selection of monitoring wells is described and the current list of wells to be monitored is provided.

- **Section 4. Monitoring Equipment and Preparation –** Each monitoring event requires an inventory of the equipment that will be taken out into the field and to have staff trained to conduct the measurement and interface with the well owners.

- **Section 5. Depth-to-Groundwater Procedures and Frequency of Monitoring and Reporting –** The resolution of measurement data is described with a brief discussion of the pros and cons of high and low sampling frequency.

- **Section 6. Recording of Monitoring Data, Data Management and the CASGEM Requirements –** Once data is brought back from the field (and laboratory); all data will need to be uploaded to the State. DWR will allow batch uploading and downloading using the CASGEM database and graphical user interface.

2.0 BACKGROUND

This section briefly describes the MV groundwater basin. The MV basin is located beneath the Truckee River, near Truckee, CA, in which the Truckee River crosses the basin from south to east in a shallow, incised channel. Principal tributaries to the Truckee River are Donner Creek, Martis Creek, and Prosser Creek. Major surface water storage reservoirs include Donner Lake, Martis Creek Lake, and Prosser Creek Reservoir. State driller logs required as part of the well construction process provide the lithology (i.e., soil types and thickness) to characterize the water-bearing formations.

Figure 1 delineates the MV groundwater basin along with overlying geography and the alignment of three basin cross sections. These cross sections are presented in **Plates 1, 2, and 3**. The geological formations in the MV basin include basement rocks, sedimentary deposits, and volcanic deposits. The two types of basement rock in this region are Cretaceous-Jurassic plutonic/metamorphic rocks and Miocene volcanic units. Plutonic/metamorphic rocks appear east of the basin and Miocene volcanic units which ranges from andesite to basalt appear adjacent to the basin. These basement rocks contain a very small portion of the groundwater. Sedimentary deposits which include stream/lake deposits and alluvial material provide storage for groundwater. Volcanic deposits include basaltic andesite lava, tuff breccia and volcaniclastic deposits, and also provide storage for groundwater. Municipal and private wells in the basin primarily extract from the Prosser Creek Alluvium and Truckee Formation, with some Shallow wells also extracting from Outwash Deposits.

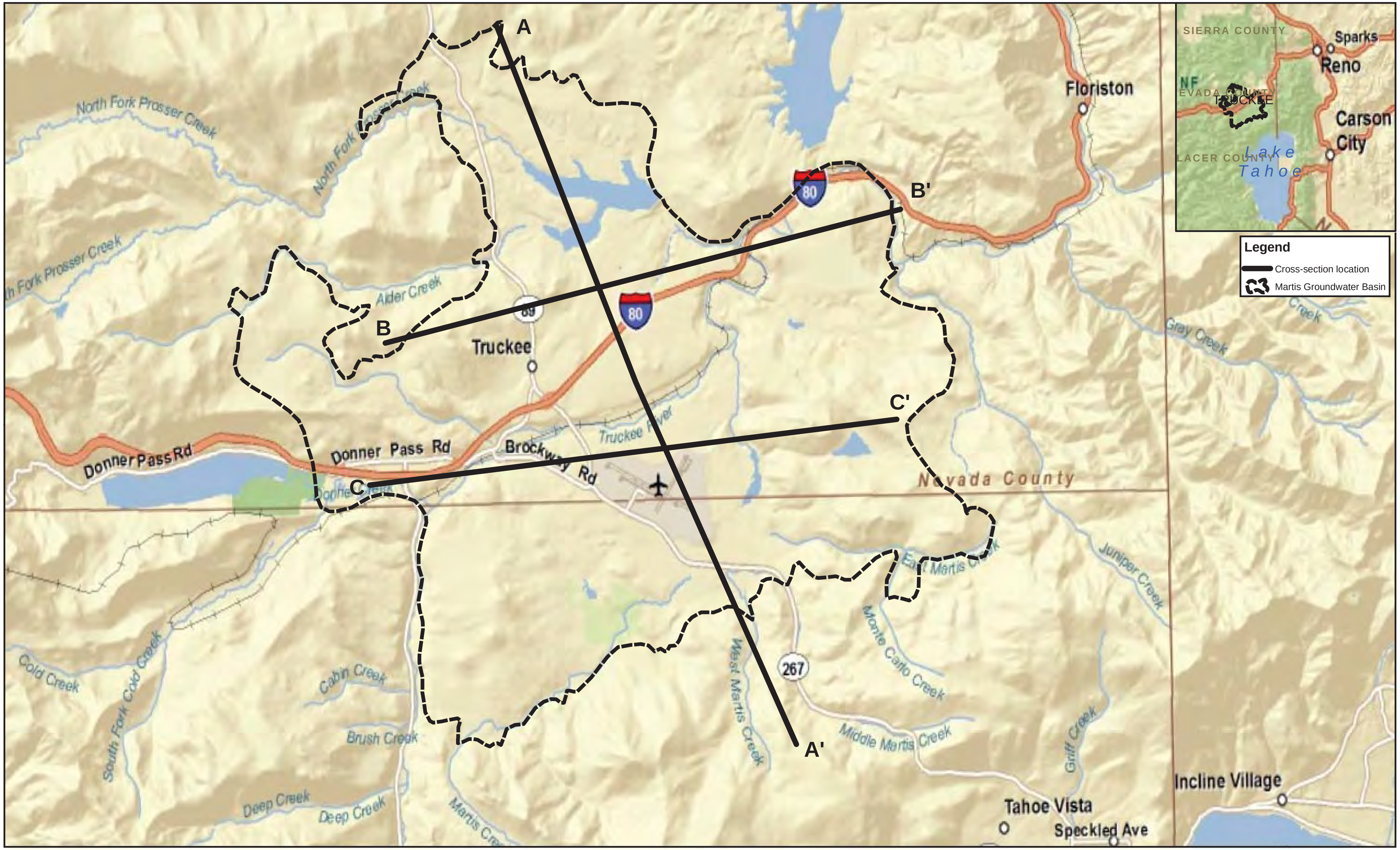

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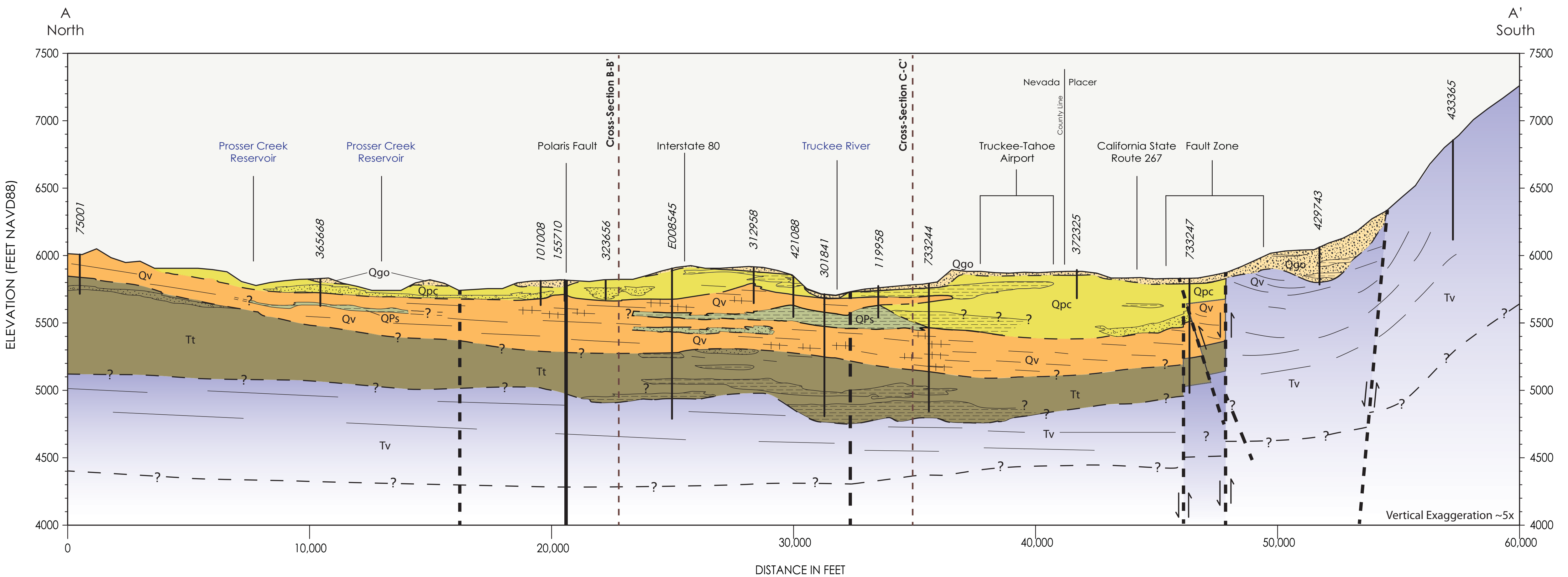
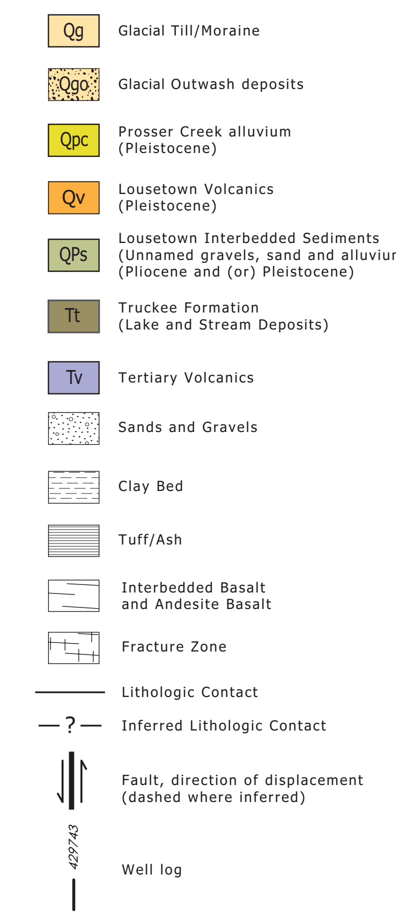
Figure 1. **Geologic cross-section locations, Martis Groundwater Management Plan, Placer and Nevada Counties, California**

210142 X-sec locations.mxd

Plate 1: Cross-section A-A'
Martis Groundwater Basin,
Placer and Nevada Counties, California





NOTES:
1. Approximate vertical exaggeration = 5x.
2. Elevation profile developed from 30-meter digital elevation model, downloaded from National Elevation Dataset (http://seamless.usgs.gov/index.php).
3. Well log locations are approximate within 600 feet.
4. Fault locations are approximate, based on Saucedo, "Geologic Map of Lake Tahoe Basin," 2005 and Hunter and others, 2011.
5. Surficial geology inferred from Saucedo, 2005.
6. Significant sand, gravel, and clay beds shown where noted in well logs.
7. Fracture zones shown where noted in well logs.

References:
Birkeland, P.W., 1963 Pleistocene History of the Truckee area, north of Lake Tahoe, California, Geological Society of America Bulletin, v. 64, p. 1453-1464.
Hunter, L.E., Howle, J.F., Rose, R.S., and Bawden, G.W., 2011, LiDAR – assisted identification of an active fault near Truckee, California, Bulletin of the Seismological Society of America, v. 101, n. 3, p. 1162-1181.
Latham, T.S., 1985, Stratigraphy, structure, and geochemistry of Plio-Pleistocene volcanic rocks of the western Basin and Range Province, near Truckee, California, unpublished doctoral dissertation, University of California, Davis, 341 p.
Melody, A., 2009, Active faulting and Quaternary paleohydrology of the Truckee Fault Zone north of Truckee, California, MS Thesis, Humboldt State University, Humboldt, CA 71 p.
Saucedo, G.J., 2005, Geologic Map of Lake Tahoe Basin, California and Nevada, California Geological Survey Regional Geologic Map Series, Map No. 4, 1:100,000 scale.

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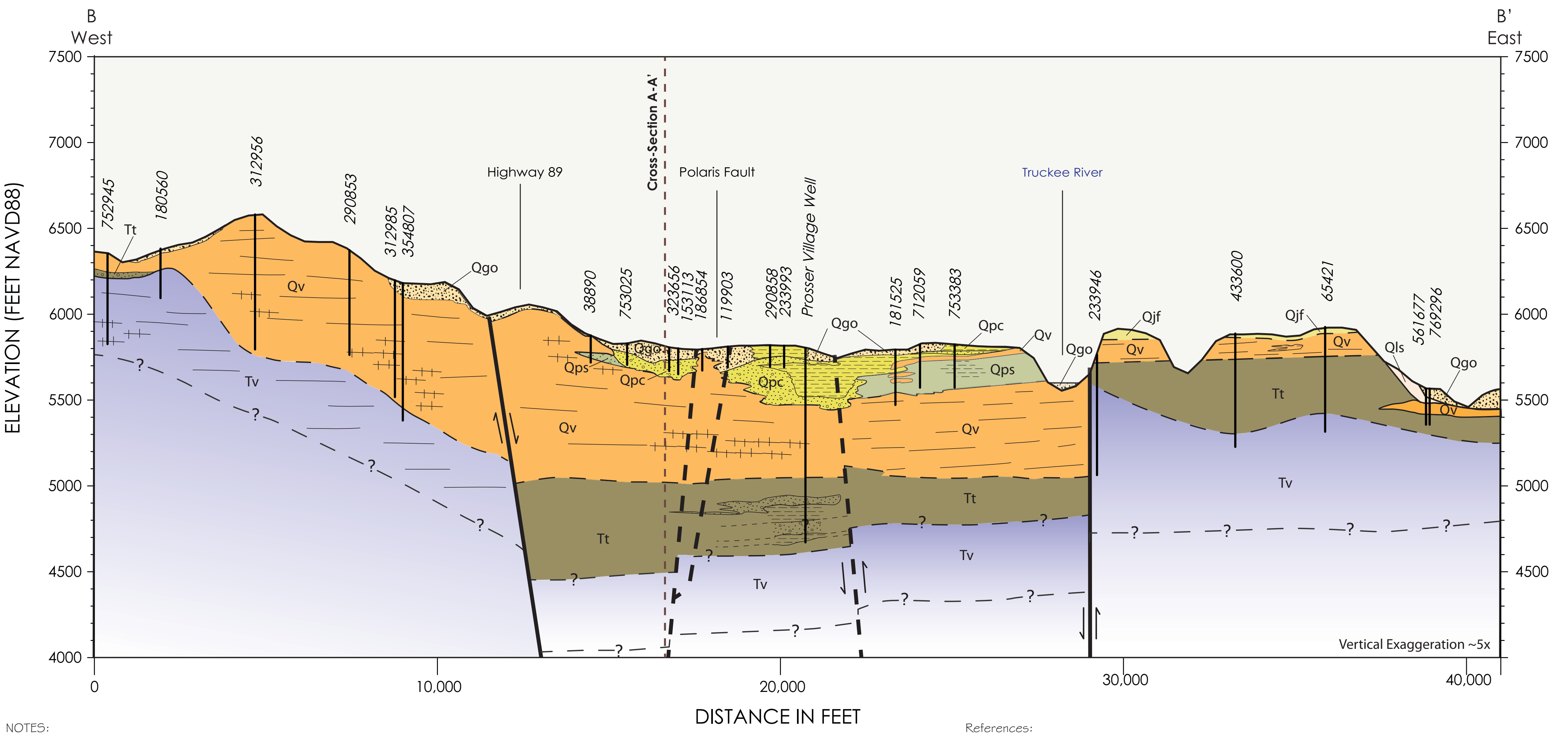
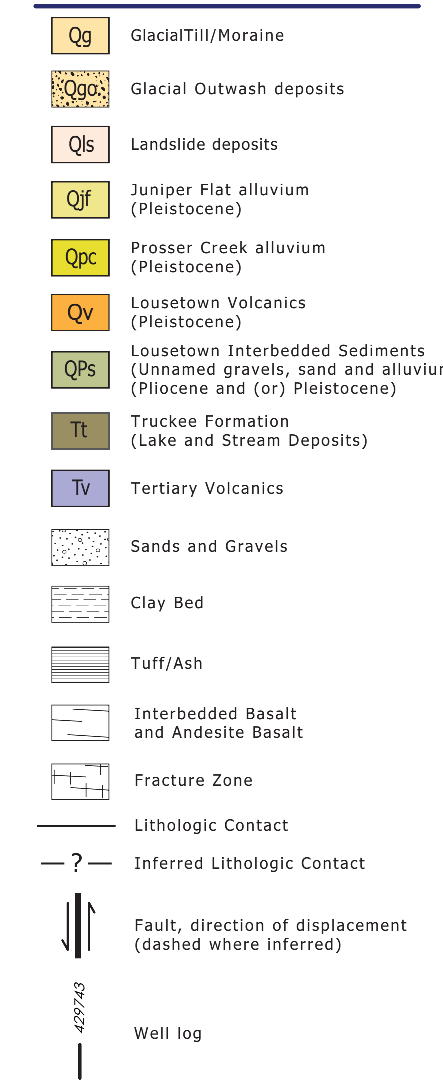
Plate 2: Cross-section B-B'
Martis Groundwater Basin,
Placer and Nevada Counties, California





NOTES:
1. Approximate vertical exaggeration = 5x.
2. Elevation profile developed from 30-meter digital elevation model, downloaded from National Elevation Dataset (http://seamless.usgs.gov/index.php).
3. Well log locations are approximate within 600 feet.
4. Fault locations are approximate, based on Saucedo, "Geologic Map of Lake Tahoe Basin," 2005 and Hunter and others, 2011.
5. Surficial geology inferred from Saucedo, 2005.
6. Significant sand, gravel, and clay beds shown where noted in well logs.
7. Fracture zones shown where noted in well logs.

References:
Birkeland, P.W., 1963 Pleistocene History of the Truckee area, north of Lake Tahoe, California, Geological Society of America Bulletin, v. 64, p. 1453-1464.
Hunter, L.E., Howle, J.F., Rose, R.S., and Bawden, G.W., 2011, LiDAR – assisted identification of an active fault near Truckee, California, Bulletin of the Seismological Society of America, v. 101, n. 3, p. 1162-1181.
Latham, T.S., 1985, Stratigraphy, structure, and geochemistry of Plio-Pleistocene volcanic rocks of the western Basin and Range Province, near Truckee, California, unpublished doctoral dissertation, University of California, Davis, 341 p.
Melody, A., 2009, Active faulting and Quaternary paleohydrology of the Truckee Fault Zone north of Truckee, California, MS Thesis, Humboldt State University, Humboldt, CA 71 p.
Saucedo, G.J., 2005, Geologic Map of Lake Tahoe Basin, California and Nevada, California Geological Survey Regional Geologic Map Series, Map No. 4, 1:100,000 scale.

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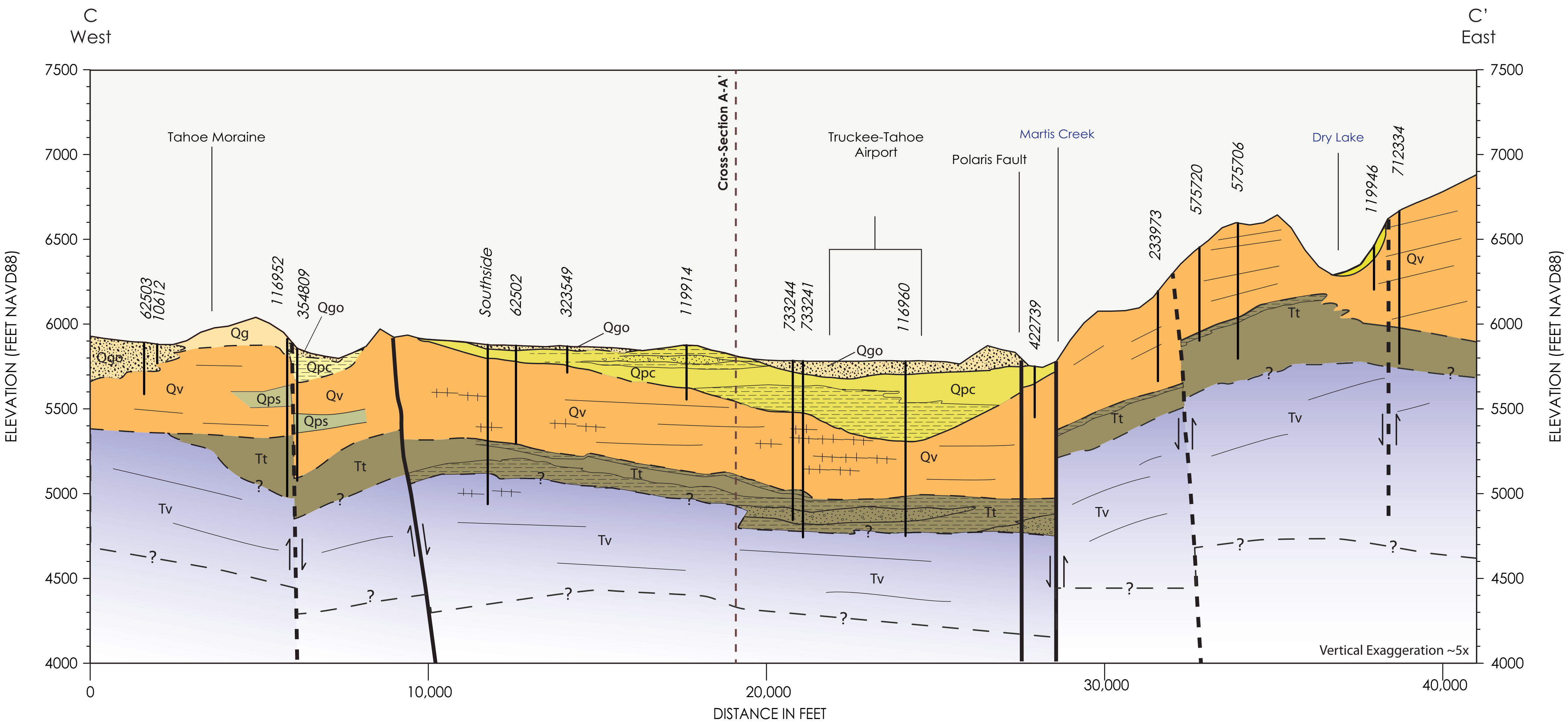
Plate 3: Cross-section C-C' Martis Groundwater Basin,

Placer and Nevada Counties, California



Qg	Glacial Till/Moraine
Qgo	Glacial Outwash deposits
Qpc	Prosser Creek alluvium (Pleistocene)
Qv	Lousetown Volcanics (Pleistocene)
QPs	Lousetown Interbedded Sediments (Unnamed gravels, sand and alluvium) (Pliocene and (or) Pleistocene)
Tt	Truckee Formation (Lake and Stream Deposits)
Tv	Tertiary Volcanics
	Sands and Gravels
	Clay Bed
	Tuff/Ash
	Interbedded Basalt and Andesite Basalt
	Fracture Zone
	Lithologic Contact
— ? —	Inferred Lithologic Contact
	Fault, direction of displacement (dashed where inferred)
429743	Well log

NOTES:
1. Approximate vertical exaggeration = 5x.
2. Elevation profile developed from 30-meter digital elevation model, downloaded from National Elevation Dataset (http://seamless.usgs.gov/index.php).
3. Well log locations are approximate within 600 feet.
4. Fault locations are approximate, based on Saucedo, "Geologic Map of Lake Tahoe Basin," 2005 and Hunter and others, 2011.
5. Surficial geology contacts inferred from Saucedo, 2005.
6. Significant sand, gravel, and clay beds shown where noted in well logs.
7. Fracture zones shown where noted in well logs.

References:
Birkeland, P.W., 1963 Pleistocene History of the Truckee area, north of Lake Tahoe, California, Geological Society of America Bulletin, v. 64, p. 1453-1464.
Hunter, L.E., Howle, J.F., Rose, R.S., and Bawden, G.W., 2011, LiDAR – assisted identification of an active fault near Truckee, California, Bulletin of the Seismological Society of America, v. 101, n. 3, p. 1162-1181.
Latham, T.S., 1985, Stratigraphy, structure, and geochemistry of Plio-Pleistocene volcanic rocks of the western Basin and Range Province, near Truckee, California, unpublished doctoral dissertation, University of California, Davis, 341 p.
Melody, A., 2009, Active faulting and Quaternary paleohydrology of the Truckee Fault Zone north of Truckee, California, MS Thesis, Humboldt State University, Humboldt, CA 71 p.
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3.0 MONITORING NETWORK

The following sections describe the rationale for selection of monitoring wells to be included in the monitoring network. Because surface water and groundwater may interact, the monitoring network may need to be expanded at some future date to include data available from surface water monitoring of major rivers and local streams. The partners involved in this Monitoring Program are also underway in preparing an updated Groundwater Management Plan (GMP) and groundwater model. It is anticipated that knowledge gained from that effort will help inform the partners and the State on where additional monitoring points, in the ground and at the surface, should be located. If existing wells are not available at such locations, the partners will seek opportunities to construct new ones in data gap areas.

3.1 RATIONALE OF MONITORING NETWORK

In order to manage groundwater resources for long-term sustainability, key issues in the basin that need to be documented include:

- Identification of sources of recharge and the protection of recharge areas
- Changes in groundwater elevations that affect groundwater storage
- Groundwater quality and changes over time

The following sections describe the rationale for selecting the MV monitoring network well sites. MV groundwater monitoring wells will be selected to provide regional coverage that can be economically accomplished yet provide high quality, reliable data that adequately characterizes basin conditions over time. The location and spacing of the MV monitoring wells are expected to vary, dependent upon a group of selected characteristics (i.e., geographic location, accessibility, age, well construction, well log availability, etc.). The approach described herein is intended to assist in the selection of monitoring locations that are sufficiently distinct from each other and address the issues bulleted above.

3.2 GROUNDWATER WELL NETWORK DEVELOPMENT PROCESS

A database of wells in Martis Valley was developed as part of the GMP and modeling effort. The State well logs provided more than 700 wells; however, these were filtered to omit wells that had limited information available, shallow depths, and other factors that rendered them not useful for hydrogeologic evaluation. The database includes 197 wells that are presented in **Figure 3-1**, in which wells owned and operated by the three partners are distinguished from the others. These wells include municipal and private, monitoring and production, and are generally concentrated in the lowland areas of the basin surrounding the Truckee River and other surface waters. In addition to these wells, wells currently monitored by the State Department of Water Resources (DWR) are presented.

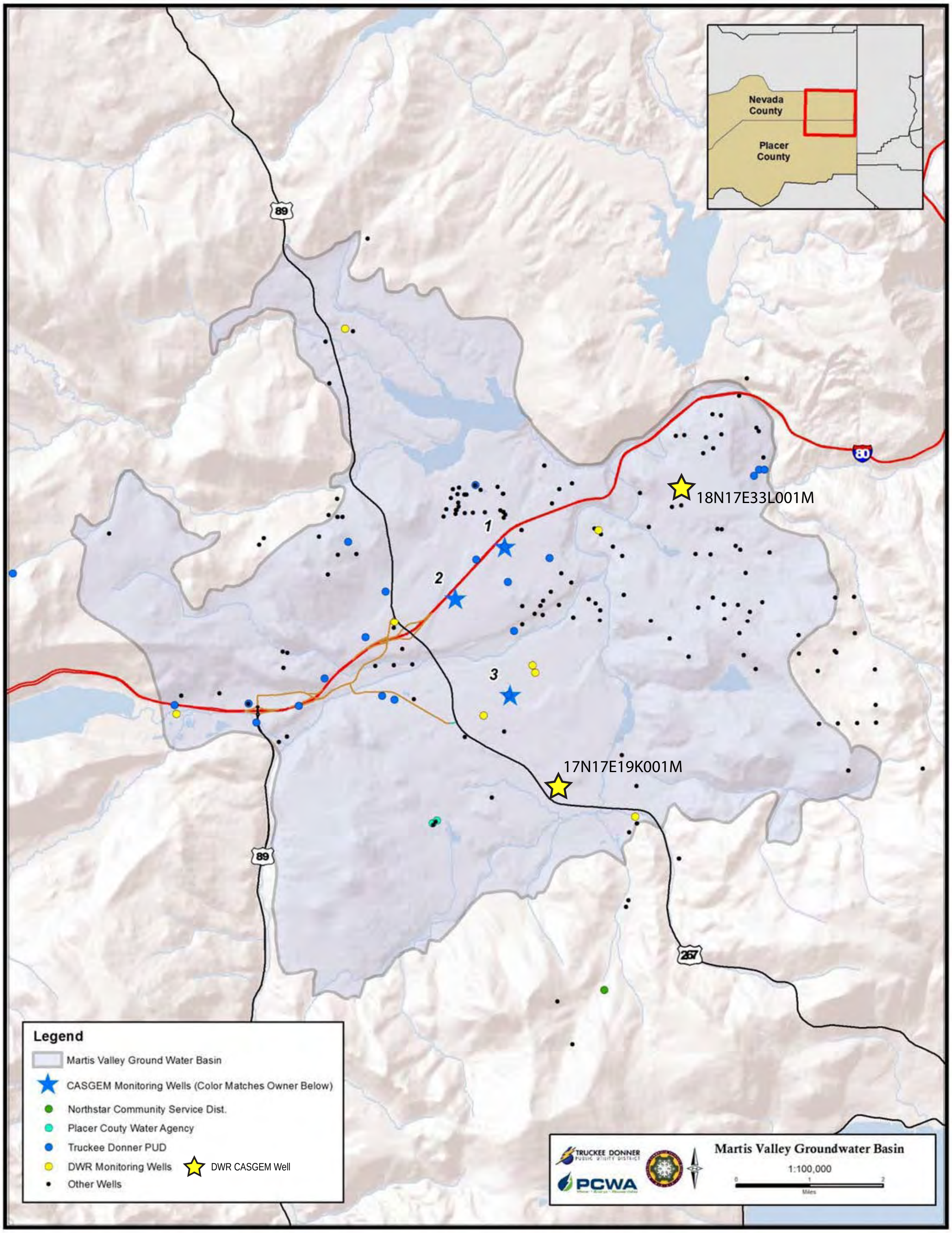


FIGURE 3-1. EXISTING WELLS IN MARTIS VALLEY

Development of a full well monitoring network will be a long-term process that is based on the scientific knowledge gained from the GMP and modeling effort that is currently underway. The network is currently limited to monitoring wells owned by TDPUD. This network includes a total of three wells that are presented in **Table 3-1** along with pertinent well information. It is expected that ideal monitoring locations as related to the issues bulleted above will be scientifically resolved in the next few years. If existing wells, such as those shown in Figure 3-1, meet the monitoring well requirements described below and can be made available, they will be used. If existing wells cannot be used, the partners will seek funding and property rights to construct designated monitoring wells in these locations. It is anticipated that desired new monitoring sites will be prioritized based on value, availability of existing wells, feasibility of installing new wells, and cost. This prioritization will ensure optimal value relative to these constraints in establishing new monitoring locations until the full network is established.

3.3 MONITORING WELL REQUIREMENTS

The following are criteria for selecting monitoring wells in the MV groundwater basin. Wells selected for monitoring should have:

- A State Well Driller Log that describes the well construction details and a description of the sediments encountered
- A detailed description of the well's location
- A brief description of the well's use (i.e. irrigation, residential)
- A relatively short screen interval in only one aquifer
- A sanitary seal to prevent surface water from entering the well
- Wells cannot be municipal (public) production wells for water supply

The most desirable wells to be included in the monitoring network are wells with short screen intervals completed within a specified aquifer. However, some wells with longer screen intervals may need to be initially included in the network when no others are available. Wells with long screen intervals may also be designated for monitoring because their long historic records provide valuable trending information. Data obtained from the longer screen wells usually represents an average of groundwater elevations across the unconfined and semi-confined aquifers.

TABLE 3-1. SELECTED INFORMATION FOR CURRENT MONITORING WELLS IN MARTIS VALLEY GROUNDWATER BASIN			
Figure 3-1 Reference Index	**1**	**2**	**3**
State Well Number	17N16E01	17N16E01	17N16E13
Reference Point Elevation (ft - NAVD88)	5,843	5,904	5,796
Reference Point Description	Top of Casing (All Three)		
Ground Surface Elevation (ft - NAVD88)	5,839	5,900	5,792
Method of Determining Elevation	Digital Terrain Model (All Three)		
Accuracy of Elevation (ft)	+/- 3 (All Three)		
Well Use	Monitoring (All Three)		
Well Status	Active (All Three)		
Geographic Coordinates (NAD83, CA Z2)			
Latitude:	39.354541	39.344834	39.325769
Longitude:	-120.14377	-120.156033	-120.143471
Method of Determining Coordinates	GPS (All Three)		
Accuracy of Coordinates (ft)	+/- 3 (All Three)		
Well Completion Type	Single (All Three)		
Casing Diameter (in.)	8	6	8
Total Depth (ft)	1,197	1,220	1,040
Screen Intervals (2 ea.) (ft)			
First Screen:	360 to 620	120 to 160	315 to 633
Second Screen:	760 to 1,160	200 to 240	707 to 978
Well Completion Report Number	733242	E008043	733241
Year Drilled	2000	2003	2000
Common Name	Prosser Village	Fibreboard	Martis Valley
Well Location Description	12546 Fairway Drive 75 Yards Southwest of Building	12650 Caleb Circle On Path to Pond	12201 Joerger Road 50 Yards East of Building

TABLE 3-1 CONTINUED. SELECTED INFORMATION FOR DWR CASGEM MONITORING WELLS IN MARTIS VALLEY GROUNDWATER BASIN		
Figure 3-1 Reference Index	17N17E19K001M	18N17E33L001M
State Well Number	17N17E19K001M	18N17E33L001M
Reference Point Elevation (ft-NAVD88)	5862.8	5922.5
Reference Point Description	Top of PVC Casing	Top of PVC Casing
Ground Surface Elevation (ft-NAVD88)	5860	5920
Method of Determining Elevation	Surveying	
Accuracy of Elevation (ft)	Within 0.1 ft.	
Well Use	Observation	Observation
Well Status	Active	Active
Geographic Coordinates (NAD83)		
Latitude:	39.3072	39.3653
Longitude	-120.1315	-120.099
Method of Determining Elevation	Unkown	
Accuracy of Elevation (ft)	Unkown	
Well Completion Type	Single Well	Single Well
Casing Diameter (in.)	2	2
Total Depth (ft)	201	200
Screen Intervals (ft)	187-197	180-190
Well Completion Report Number	N/A	365669
Year Drilled	1990	1990
Well Location Description	50 ft. South of Martis Creek Rd. 1000 ft. east of the intersection of Martis Creek Rd. and Hwy 267.	Truckee Fire Protection District P.O. Box 686 Truckee, CA

3.4 REQUIRED STEPS IN SELECTING A NEW MV MONITORING WELL

Upon selection of any new well, that is not currently a MV monitoring well, to be potentially included in the monitoring network, a site visit will be necessary to assess the field conditions. The conditions necessary for a well to be used in the network include:

- A well owner (and tenant) who will allow access for monitoring.
- All-weather access, key to locked gates or fences, and no guard dogs.
- Ability to survey the ground elevation and reference point elevation of the well. See Page 9 of the DWR Groundwater Elevation Monitoring Guidelines for details establishing the reference point.
- A clear access point through the pump or well casing for water-level sounders. Figure 3-2 shows a typical well sounding location detail.
- An assessment to determine if lubrication oil from a turbine pump has accumulated in the well or if there are obstructions in the well that would prevent obtaining repeat and reliable measurements.
- If currently in use, to have access in shutting a well down for a minimum 2-hour period (24-hous preferred) for reaching quasi-equilibrium.
- For wells that are owned by others, private or public, the protocols discussed below shall be followed for explaining the project purpose and establishing rights for access.
- If a new monitoring well is to be installed, appropriate hydrogeologic investigation shall be made, a design that considers the specific needs of monitoring shall be prepared, and the well shall be drilled under the observation and direction of a hydrogeologist.

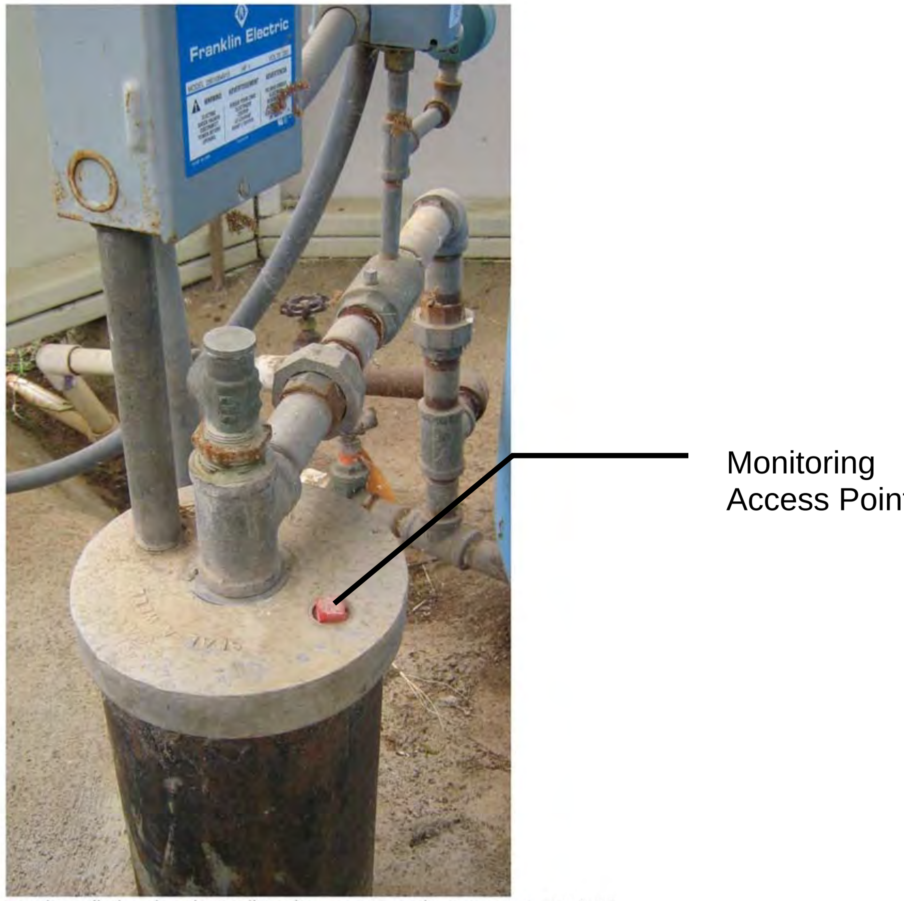


Photo: A domestic well showing the well casing, cover, and conveyance system.
The well is located inside a shed with a concrete floor.

FIGURE 3-2. ACCESS POINT ON A WELL

Before knocking on the door of potential well owners, every effort should be made to justify the need for the owner's well in the network. Staff shall coordinate with Right-of-Way personnel to arrange a field visit if the owner allows it. The reason for monitoring and the benefits to long-term sustainability shall be described. Additionally, practical details about site access and how measurements are made shall be discussed. If the owner is interested in allowing their well into the network, the well shall be inspected for adequacy based on the bulleted criteria above. If the well is adequate, formal rights of entry shall be prepared by Right-of-Way personnel before proceeding. Any special contact information to perform the monitoring should also be noted along with information related to sites where a tenant is renting from the property owner. These steps will ensure consistent monitoring even though monitoring staff, tenants and well site access may change over time.

4.0 MONITORING EQUIPMENT AND PREPARATION

This section provides the MV monitoring entities with a “how to” manual for accessing monitoring wells and, taking depth-to-groundwater measurements and water quality samples. The range of equipment and protocols covered in this section will assist monitoring staff with the challenges that exist in the field. Each time a well is accessed as part of a monitoring event, staff needs to conduct themselves in a professional manner by being prepared with the right equipment and looking prepared with the correctly labeled vehicle and clothing, and pertinent staff identification. Staff should also strive to maintain a good relationship with the well owners and demonstrate genuine courtesy.

This section also provides relevant portions of the CASGEM Groundwater Elevation Monitoring Guidelines (Guidelines) handbook attached as Appendix A. The CASGEM handbook is intended for the following purpose:

> …*Guidelines were developed to assist DWR by establishing criteria for the selection and measurement of monitoring wells in the event that DWR is required to perform the groundwater monitoring functions in lieu of a local monitoring agency pursuant to Water Code Section 10933.5(a).*

The Guidelines also imply that a local agency that wishes to take over an existing monitoring well or create a new monitoring well should follow a documented consistent approach for each well over the life of the well. Given the unique location, construction technique, and down-hole equipment installation, measurement of each well should endeavor to follow the Guidelines knowing that field conditions may require slight deviations. This endeavor leads to the need of having a specialized documented procedure for each monitoring well that ensures a consistent measurement technique over time (some wells dating back to the 1930s). Changes in the well setting, use, and equipment may change over time, requiring changes in monitoring techniques. Wells constructed for and devoted to monitoring the groundwater can also change depending on activities around the well that may artificially change the static condition of groundwater levels (e.g., construction and use of a nearby high-production municipal well) or the elevation of the well head (e.g., well is located in proposed paved area where the well head will be cut below grade with a sealed and locked access chamber flush to pavement).

4.1 PERSONNEL TRAINING

All well monitoring programs are subject to turnover in agency staff. The best and most effective way of transitioning and training new staff is to have new staff work alongside the experienced staff during a transition period. Absent this on-the-job-training, thorough record keeping, periodic updating of the monitoring plan, and review of this document will expose new staff to the wells and the protocols followed from previous measurements.

4.2 WELL MONITORING LOG BOOK (WMLB)

The WMLB is the definitive field document that contains the following:

- Well owner and contact information
- Special entrance instructions (e.g., call at gate, honk horn, or dog off leash)
- A schematic identifying the location of the well (high-resolution aerial imagery can also be used if the monitoring well can be clearly identified)
- Pictures of the well including reference point and access port (See **Figure 4-1**)
- Checklist of special instructions based on well owner requirements or special conditions (i.e. – closed gates, protected wetlands, electrical power shut off, etc.)
- Equipment needed for measurement (i.e., some wells require walking a fair distance into the field, wrench to remove access plug)
- Ground and reference point elevations and source of measurement
- List of historical measurements and codes identifying questionable measurements or field conditions making measurements impossible

Multiple wells can be in the same WMLB for convenience out in the field. This will likely be the case if multiple agencies will be making measurements within their respective jurisdiction. An example of the minimum data form and information kept for each well is taken from the CASGEM Guidelines, as shown on Figure 4-1.

4.2.1 Required Equipment

The monitoring agency will need to compile a set of tools and have them stored in a designated location at the monitoring agency's premises. The equipment should be in a locked toolbox that can easily be carried by one person, if needed. The CASGEM Guidelines include a list of field equipment needed for the initial well measurements, as shown on **Figure 4-2**. Once all wells have established reference points and measurement conditions, a shorter list of supplies can be assembled for field measurements as follows:

- Digital camera
- Crescent wrench (large and small)
- Channel lock pliers (large and small)
- Small hammer and rubber mallet

State of California | DEPARTMENT OF WATER RESOURCES | California Natural Resources Agency

WELL DATA

State No. ____________

District ____________

OWNER		STATE NO.	
ADDRESS		OTHER NO.	
TENANT			
ADDRESS			
TYPE OF WELL ☐ SPECIAL STUDIES	☐ MONTHLY	☐ SEMI ANNUAL	☐ WATER QUALITY
LOCATION: COUNTY	BASIN		NO.
U.S.G.S. QUAD.		QUAD NO.	
$^1/_4$	$^1/_4$ SECTION TWP.	RGE.	MD ☐ SB BASE & MERIDIAN H ☐
COORDINATES X:	Y:	SOURCE:	
DESCRIPTION			
REFERENCE POINT DESCRIPTION			
WHICH IS FT. ABOVE ☐ BELOW ☐	LAND SURFACE.	GROUND ELEVATION	FT.
REFERENCE POINT ELEVATION FT.	DETERMINED FROM		
WELL: USE	CONDITION		DEPTH FT.
CASING, SIZE IN.,		PERFORATIONS	
MEASUREMENTS BY: ☐ DWR ☐ USGS	☐USBR ☐ COUNTY	☐ IRR. DIST. ☐WATER DIST.	☐CONS. DIST.
CHIEF AQUIFER: NAME	DEPTH TO TOP AQ.	DEPTH TO BOT. AQ.	
TYPE OF MATERIAL	PERM. RATING	THICKNESS	
GRAVEL PACKED? ☐ YES ☐NO	DEPTH TO TOP GR.	DEPTH TO BOT GR.	
SUPP. AQUIFER	DEPTH TO TOP AQ.	DEPTH TO BOT. AQ.	
DRILLER	DATE DRILLED:	LOG NUMBER:	
EQUIPMENT: PUMP, TYPE		MAKE	
SERIAL NO.	SIZE OF DISCHARGE PIPE IN.	WATER ANALYSIS: MIN. (1) SAN. (2)	H.M. (3)
POWER, KIND	MAKE	WATER LEVELS AVAILABLE: YES (1)	NO
H.P.	MOTOR SERIAL NO	PERIOD OF RECORD: BEGIN	END
ELEC. METER NO.	TRANSFORMER NO.	COLLECTING AGENCY:	
YIELD	G.P.M. PUMPING LEVEL FT.	PROD. REC. (1) PUMP TEST (2)	YIELD (3)
SKETCH N		REMARKS	
		RECORDED BY:	
		DATE:	

DWR 429 (Rev. 1/09)

Source: Table 3. General Well Data Form, CASGEM Guidelines, DWR, December 2010

FIGURE 4-1. GENERAL WELL DATA FORM (DWR FORM 429)

FIGURE 4-2. CASGEM FIELD EQUIPMENT LIST

Equipment and supplies needed for (a) all measurements, (b) establishing permanent RP, (c) steel tape method, (d) electric sounding tape method, (e) sonic water-level meter, and (f) automated measurements with pressure transducer.
(a) All measurements
GPS instrument, digital camera, watch, calculator, and maps
General well data form (DWR Form 429; see Table 3)
Pens, ballpoint with non-erasable blue or black ink, for writing on field forms and equipment log books
Well file with previous measurements
Measuring tape, graduated in feet, tenths, and hundredths of feet
Two wrenches with adjustable jaws and other tools for removing well cap
Key(s) for opening locks and clean rags
(b) Establishing a permanent reference point
Steel tape, graduated in feet, tenths, and hundredths of feet
Calibration and maintenance log book for steel tape
Paint (bright color), permanent marker, chisel, punch, and(or) casing-notching tool
(c) Steel tape method
DWR field form 1213 (see Table 5)
Steel tape, graduated in feet, tenths, and hundredths of feet
Calibration and maintenance log book for steel tape
Weight (stainless steel, iron, or other noncontaminating material – do not use lead)
Strong ring and wire, for attaching weight to end of tape. Wire should be strong enough to hold weight securely, but not as strong as the tape, so that if the weight becomes lodged in the well the tape can still be pulled free.
Carpenters' chalk (blue) or sidewalk chalk
Disinfectant wipes, and deionized or tap water for cleaning tape.
(d) Electric sounding tape method
DWR field form 1213 (see Table 5)
Steel tape, graduated in feet, tenths, and hundredths of feet
An electric tape, double-wired and graduated in feet, tenths, and hundredths of feet, accurate to 0.01 ft. Electric sounding tapes commonly are mounted on a hand-cranked and powered supply reel that contains space for the batteries and some device ("indicator") for signaling when the circuit is closed.
Electric-tape calibration and maintenance log book; manufacturer's instructions.
Disinfectant wipes, and deionized or tap water for cleaning tape.
Replacement batteries, charged.
(e) Sonic water-level meter method
DWR field form 1213 (see Table 5)
Temperature probe with readout and cable
Sonic water-level meter with factory cover plate
Custom sized cover plates for larger well diameters
Replacement batteries
(f) Automated measurements with pressure transducer
Transducer field form (see Figures 1 and 2 in Drost, 2005: http://pubs.usgs.gov/of/2005/1126/pdf/ofr20051126.pdf)
Transducer, data logger, cables, suspension system, and power supply.
Data readout device (i.e., laptop computer loaded with correct software) and data storage modules.
Spare desiccant, and replacement batteries.
Well cover or recorder shelter with key.
Steel tape (with blue carpenters' chalk or sidewalk chalk) or electric sounding tape, both graduated in hundredths of feet.
Tools, including high-impedance (digital) multimeter, connectors, crimping tool, and contact-burnishing tool or artist's eraser.

Source: Table 4- Equipment and Supply List, CASGEM Guidelines, DWR, December 2010

- Keys for gates and monitoring well covers
- Stop watch
- Wasp or hornet nest spray
- Twelve-foot tape measure
- Pencil and graph paper
- First aid kit

Minimum Tools needed for actual in the field depth-to-groundwater measurements include:

- 200-foot well sounding steel tape measure
- Blue chalk for metal tape
- 200-foot electronic well sounding probe (See **Figure 4-3**)
- Soap, high-purity water, and spray bottle for cleaning tape and probe
- Sterilizer solution for tape and probe to prevent introducing contaminants to a the well

FIGURE 4-3. WELL SOUNDING PROBE AND TAPE

4.3 CHALLENGES TO BE PREPARED FOR

The steps necessary to complete a measurement of depth to groundwater are different for each monitoring well. See Pages 14 through 28 of the DWR Groundwater Elevation Monitoring guidelines for details on measuring water levels. Monitoring staff will need to understand these steps before accessing the well's property location. The WMLB will include a written and graphical stepwise illustration to fully inform monitoring staff. Consideration of how diversified the steps could be are illustrated in the following real-life examples:

- **Well is located on hilly terrain with no defined access trail or markers –** This type of well benefits from training new staff for at least two monitoring events. Absent the on-the-job experience the WMLB should be detailed enough in its descriptions and images to find the well. Steeper terrain may also require several trips to the vehicle for equipment to ensure free hands are available in case of a fall.

- **Well has no access port or casing bolt –** Many of the older wells and private domestic wells were not designed for dropping a tape measure or probe into the well. In these cases, the monitoring staff should clearly identify the access point by using orange utility marking spray paint while being careful to not get paint overspray into the well itself. Absent the paint identifier, the tape chalk can be used as well, but it may disappear over time due to rain and wind. Wells with only a small slit at the base of the concrete casing interface will require a tape measurement.

- **Well can only be accessed when owner is home –** This occurs in many cases where the well owner has to unlock a gate or simply wants to be home when the monitoring event occurs. In this case, an appointment is made by phone providing owner with a 1 hour or less window when monitoring staff will show up. In cases where this is needed to open a locked gate, the owner may allow access and then request that the gate be closed and locked when finished. Review the checklist in the WMLB before leaving the monitoring well.

- **Well is running when monitoring staff arrive –** If the well is a municipal production well or large agricultural well, it is best to work with the well owner to allow a 24-hour period of off-time before taking a measurement. If the well owner is not responsive to this request, ask to turn off the well upon arrival and monitor recovery. If the well is a private domestic well, ask if the water use can be turned off (typically a hydropneumatic tank will allow small quantities of water use without the well turning on) and monitor recovery as explained in next chapter.

- **Well casing is set flush to the ground –** This occurs when a well uses a submersible pump or no pump and no onsite hydropneumatic tank– in most cases this is a private well that may be abandoned or the tank is located away from well. In addition, wells with no visible casing can become covered with vegetation or debris and be difficult to find. In both cases, monitoring staff should stake the well and paint the wood stake orange.

- **Reference point is missing or the wellhead has been replaced –** This occurs if the reference point is not a permanent mark such as a cut or welded steel marker. This will also occur when a well is deepened or redrilled and the upper casing has been replaced. Monitoring staff will need to select a permanent mark (e.g., top of casing, monitoring hole) where the depth to groundwater can be measured. Monitoring staff should also measure the distance between the new reference point and the ground elevation at the base of the well. This measurement should be noted in the logbook.[2]

[2] The elevation of the new reference point will be calculated by the assigned data entry personnel using the ground elevation from the original survey and the reference point distance measured by field staff. The data entry personnel will need to be careful if the groundwater elevation is an automated calculation (i.e., past measurements will need to keep the old reference point) in a spreadsheet or DMS.

5.0 DEPTH-TO-GROUNDWATER PROCEDURES AND FREQUENCY OF MONITORING AND REPORTING

The following section describes the frequency for monitoring and reporting and describes the depth-to-groundwater measurement during each of the designated monitoring periods. **Figure 5-1** provides a form for documenting these described field measurements. An alternate form can be used if desired as long as the salient information is included. See also Pages 5 through 7 of the DWR Groundwater Elevation Monitoring Guidelines for additional details.

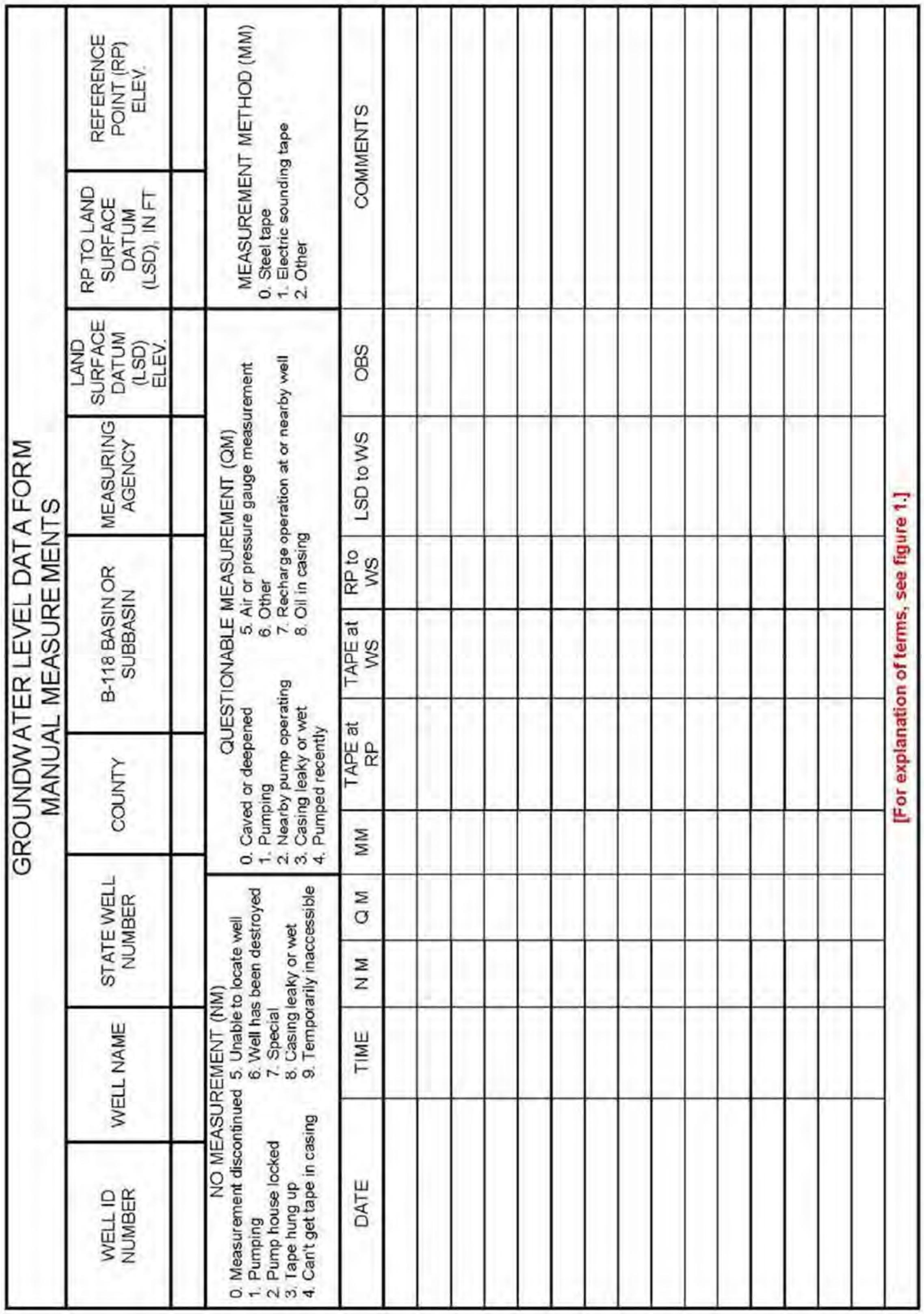
5.1 SEMIANNUAL GROUNDWATER-LEVEL MONITORING

Groundwater levels from all designated monitoring wells listed in Table 3-1 will be measured in the spring and fall (semiannually). Spring is generally considered to be the first week in May. Fall is generally considered to be the first week of November. If possible, all groundwater-level measurements should be taken within a 2-week period and, if possible, coordinate groundwater-level monitoring with DWR and its semiannual measurements.

5.2 DEPTH-TO-GROUNDWATER MONITORING PROCEDURES

DWR's Groundwater Elevation Monitoring Guidelines (see Appendix A) provide a complete set of procedures for measuring the depth to groundwater. The following procedures are included to supplement the CASGEM's broader guidelines. Over time, as monitoring staff become familiar with the well sites, a customized list can be documented. Staff will find that steps and monitoring equipment identified in the Guidelines do not apply to the wells being measured in the MV region or additional steps are required. The one exception to the MV monitoring wells is those that are measured through a continuous data logger. It is expected that the agency owning these wells will be downloading data collected by these devices separately from the MV Monitoring Program. This section focuses on measuring the depth to groundwater at designated MV monitoring well sites using a sounding probe or metal tape. Water-level measurements will be collected semiannually to assess the groundwater flow direction and to detect trends that can lead to improved management of the groundwater resources.

Each well has been assigned a unique Well Log identification (ID) number. The numbers and pertinent information for each well are listed in Table 3-1. Figure 6-1 (DWR Form 429, Page 11) extracted from the DWR's CASGEM Monitoring Guideline Handbook, along with the time and date of the measurement is recorded with groundwater-level measurements during the semiannual monitoring event.



GROUNDWATER LEVEL DATA FORM
MANUAL MEASUREMENTS

WELL ID NUMBER	WELL NAME	STATE WELL NUMBER	COUNTY	B-118 BASIN OR SUBBASIN	MEASURING AGENCY	LAND SURFACE DATUM (LSD) ELEV.	RP TO LAND SURFACE DATUM (LSD), IN FT	REFERENCE POINT (RP) ELEV.

NO MEASUREMENT (NM)
0. Measurement discontinued
1. Pumping
2. Pump house locked
3. Tape hung up
4. Can't get tape in casing
5. Unable to locate well
6. Well has been destroyed
7. Special
8. Casing leaky or wet
9. Temporarily inaccessible

QUESTIONABLE MEASUREMENT (QM)
0. Caved or deepened
1. Pumping
2. Nearby pump operating
3. Casing leaky or wet
4. Pumped recently
5. Air or pressure gauge measurement
6. Other
7. Recharge operation at or nearby well
8. Oil in casing

MEASUREMENT METHOD (MM)
0. Steel tape
1. Electric sounding tape
2. Other

DATE	TIME	N M	Q M	MM	TAPE at RP	TAPE at WS	RP to WS	LSD to WS	OBS	COMMENTS

[For explanation of terms, see figure 1.]

DWR Form 1213 (modified 6/28/2010) (data for Water Data Library)

FIGURE 5-1. GROUNDWATER-LEVEL DATA FORM FOR MANUAL MEASUREMENTS

The depth-to-static-groundwater level will be obtained at each well using an electric water-level sounder with a cable graduated in increments of 0.01 foot. Before measurement, monitoring staff will need to review the WMLB for the location of the reference point and measurement access port.   A crescent wrench may be needed to access the well casing for measurement. Monitoring staff will need to also review past measurements in the WMLB to allow for careful lowering of the probe or tape.[3] To obtain a depth-to-water measurement, the electric sounder cable or tape will be lowered into the well to within 20 feet short of past measurements taken in the same season of the year, spring or fall.

Monitoring staff will continue to slowly lower the probe through the access port until the sounder indicates submergence by either a beeping sound or a light, depending on the type of signal installed for that particular model. At this point, the sampling personnel will note the depth to water (to the nearest 0.01 foot) from the reference point. The depth will be confirmed by lifting the sounder above the water surface by about 2 to 3 feet and then remeasuring the depth to water. If the depth remains constant, the depth to water will be recorded on Figure 6-1 (DWR Form 1213, Page 18). If measurements are showing change with each measurement, the monitoring staff will indicate the issue on the form and, with it, attach a graphic curve of the variable nature of the measurement, and its possible cause (e.g., bouncing, recovering water level).

5.3 QUALITY CONTROL

After completing their field work, the monitoring staff will enter the data into an electronic database management system. The monitoring staff will review the groundwater-level and water quality data for accuracy within 5 days of obtaining the measurements. Should a measurement appear suspicious, a groundwater level confirmation reading will be obtained.

[3] Tape measurements will require chalking of the tape and repeated measurements as per the CASGEM Guidelines (Page 15).

6.0 RECORDING OF MONITORING DATA, DATA MANAGEMENT AND THE CASGEM REQUIREMENTS

Once data is brought back from the field it will need to be digitized and loaded onto the CASGEM website. The partners will be collecting data from their respective wells and distributing it to the plan administrator, which is currently Placer County Water Agency. The Agency will function as the clearinghouse of all data that is relevant to the MV groundwater basin. In addition, the Agency will be the primary point of contact for the CASGEM Program and will upload all relevant data in a timely manner. The steps laid out currently for CASGEM participation are described as follows (see Appendix C, On-line Submittal System Manual):

> *Phase 1 of the CASGEM System was released in December, 2010, and allows prospective Monitoring Entities to do the following:*
>
> - *Create, edit, and submit notifications to become a Monitoring Entity*
> - *Create and manage user accounts*
> - *Create and manage agency information*
> - *Submit GIS shapefiles of mapped monitoring areas*
>
> *Phase 2 of the CASGEM System, released in May, 2011, makes the following additional functions available to prospective Monitoring Entities:*
>
> - *Submittal of groundwater monitoring plans*
> - *Submittal of well construction and location information on monitoring wells proposed to be monitored*
> - *Allow corrections to initial Monitoring Entity notifications or submittal of additional information requested by DWR*
> - *Ability to view and query maps of groundwater basins, proposed monitoring areas, monitored wells, and other geographic information associated with the CASGEM Program Phase 3 of the CASGEM System, scheduled for release in late fall, 2011, will allow designated Monitoring Entities to do the following:*

- *Submit groundwater elevation measurement data*
- *View and update their CASGEM data, as needed*

With Phase 3 of the CASGEM System, public access to the Statewide CASGEM data will be available. Users will be able to download data and view spatial and temporal groundwater elevation trends in the GIS viewer application.

(URL: http://www.water.ca.gov/groundwater/casgem/submittal_system.cfm, On-line Submittal System, DWR)

The Agency has already completed Phase 1 of the CASGEM Program. The next step requires entry of data for each of the monitoring wells included as part of this Monitoring Program. **Figure 6-1** is taken from the CASGEM On-line System manual. The manual states that “Data may be entered on a well-by-well basis on a system data entry screen, or users can do a batch upload of information from multiple wells (using a spreadsheet template available for download within the system).” The latter will likely be the best method for entering the data given that most of the well information is already captured in an Excel Workbook.

Data entry for groundwater elevations is not fully described but will likely be similar to the well inventory where a spreadsheet template can be uploaded for all groundwater-elevation data. The conversion of groundwater-elevation data from a database (including GIS) platform is typically straight forward with a copy-and-paste step or a small routine that outputs the data in the desired format.

The inventory of Martis Valley well data will be based on DWR’s CASGEM Monitoring Plan Summary attached as **Appendix B**. The set of data fields used for each well will require a decision on its need based on Appendix B requirements.

FIGURE 6-1. CASGEM'S WELL INVENTORY INPUT FORM

Appendix A

CASGEM Guidelines

Department of Water Resources

Groundwater Elevation Monitoring

Guidelines

December 2010

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INTRODUCTION TO THE CASGEM PROGRAM

On November 4, 2009 the state legislature amended the Water Code with SB 6, which mandates a statewide, locally-managed groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. To achieve that goal the amendment requires collaboration between local Monitoring Entities and the Department of Water Resources (DWR) to collect groundwater elevation data. In accordance with the amendment, DWR developed the California Statewide Groundwater Elevation Monitoring (CASGEM) program.

If no local entities volunteer to monitor groundwater elevations in a basin or part of a basin, DWR may be required to develop a monitoring program for that part. If DWR takes over monitoring of a basin, certain entities in the basin may not be eligible for water grants or loans administered by the state.

DWR will report findings of the CASGEM program to the Governor and the Legislature by January 1, 2012 and thereafter in years ending in 5 or 0.

PURPOSE OF GUIDELINES FOR DWR MONITORING

The following Guidelines were developed to assist DWR by establishing criteria for the selection and measurement of monitoring wells in the event that DWR is required to perform the groundwater monitoring functions in lieu of a local monitoring agency pursuant to Water Code Section 10933.5(a).

The primary objective of the CASGEM monitoring program is to define the seasonal and long-term trends in groundwater elevations in California's groundwater basins. The scale for this evaluation should be the static, regional groundwater table or potentiometric surface. A secondary objective is to provide sufficient data to draw representative contour maps of the elevations. These maps could be used to estimate changes in groundwater storage and to evaluate potential areas of overdraft and subsidence.

Although it is not an objective of the CASGEM program, it would be valuable to include monitoring wells near localized features that impact more dynamic groundwater elevations. These features would include wells near aquifer storage and recovery projects, near high volume pumping wells, and near rivers.

NETWORK DESIGN CONCEPTS

SELECTION OF MONITORING WELLS FOR MONITORING PLANS

The number of groundwater wells that need to be monitored in a basin to adequately represent static water levels (and corresponding elevations) depends on several factors, some of which include: the known hydrogeology of the basin, the slope of the groundwater table or potentiometric surface, the existence of high volume production wells and the frequency of their use, and the availability of easily-accessible monitoring wells. Dedicated groundwater monitoring wells with known construction information are preferred over production wells to determine static water levels, and monitoring wells near rivers or aquifer storage and recovery projects should be avoided due to the potential for rapidly fluctuating water levels and engineered groundwater systems. The selection of wells should be aquifer-specific and wells which are screened across more than one aquifer should not be candidates for selection.

Heath (1976) suggested a density of groundwater monitoring wells ranging from 2 wells per 1,000 square miles (mi^2) for a large area in which only major features are to be mapped, to 100 wells per 1,000 mi^2 for a complex area to be mapped in considerable detail. The objective of the Heath (1976) design was to evaluate the status of groundwater storage and the areal extent of aquifers.

Sophocleous (1983) proposed a redesign of a water-level monitoring program for the state of Kansas based on efficiency, economics, statistical analysis, comparison of water-level hydrographs, and consistency across the state. The Sophocleous study recommended a "square well network" with a density of 1 observation well per 16 mi^2.

The Texas Water Development Board proposed varying well network densities for counties according to the amount of groundwater pumpage. These densities range from 0.7 wells per 100 mi^2 for counties with 1,000-2,500 acre-feet per year (AF/yr) of pumpage to 4 wells per 100 mi^2 for counties with over 100,000 AF/yr of pumpage (Hopkins, 1994). These densities were converted to pumpage per 100 mi^2 area by dividing by the size of an average county in Texas of about 1,000 mi^2 (Table 2)

Most designs of water-level monitoring programs rely on a probabilistic approach. Alley (1993) discussed four probabilistic designs: (1) simple random sampling throughout an aquifer; (2) stratified random sampling within different strata of an aquifer; (3) systematic grid sampling (e.g., at the midpoint of each section within an aquifer); and (4) random sampling within blocks (e.g., randomly selected wells within each section of an aquifer). The Sophocleous (1983) program used the third approach, systematic grid sampling. The guidelines on well density from the programs mentioned above are summarized in Table 2.

Based on the few referenced studies with specific recommendations, the consensus appears to fall between 2 and 10 groundwater monitoring wells per 100 mi^2. The exceptions to this density range include the lower end of the Heath (1976) range and the low-use counties in Texas.

There will always be a tradeoff between the improved spatial (and temporal) representation of water levels in an aquifer and the expense of monitoring. A higher-resolution contour map would be warranted in an area with a greater reliance upon groundwater in order to anticipate potential problems, such as supply and groundwater contamination concerns, while a lower-resolution contour map might be sufficient in an area with few people or a low reliance upon groundwater. Ideally, areas with relatively steep groundwater gradients or areas of high recharge or discharge would have a greater density of monitoring wells.

The illustrations in Figure 1 show a local groundwater elevation contour map developed with different numbers of wells. The examples cover the same area and use the same dataset, with wells randomly deleted by grid area from the full dataset to create a less dense network of wells. The resulting range of plotting density is 2 to 20 groundwater monitoring wells per 100 mi^2. The contours in Figure 1 show how the accuracy and resolution of the contour map increases with the density of wells used for plotting. To avoid presenting misleading contour maps, only wells with the best possible elevation accuracies should be used. These accuracies are a combination of the accuracies in the water-level measurement and the reference point (RP) measurement. Unless the RP elevation has been surveyed, it will be the limiting factor on elevation accuracy.

Program and(or) Reference	**Density of monitoring wells (wells per 100 mi^2)**
Heath (1976)	0.2 – 10
Sophocleous (1983)	6.3
Hopkins (1994) (a) Basins with >10,000 AF/yr groundwater pumping per 100 mi^2 area	4.0
(b) Basins with 1,000-10,000 AF/yr groundwater pumping per 100 mi^2 area	2.0
(c) Basins with 250-1,000 AF/yr groundwater pumping per 100 mi^2 area	1.0
(d) Basins with 100--250 AF/yr groundwater pumping per 100 mi^2 area	0.7

Table 1. Recommended density of monitoring wells for groundwater-level monitoring programs.

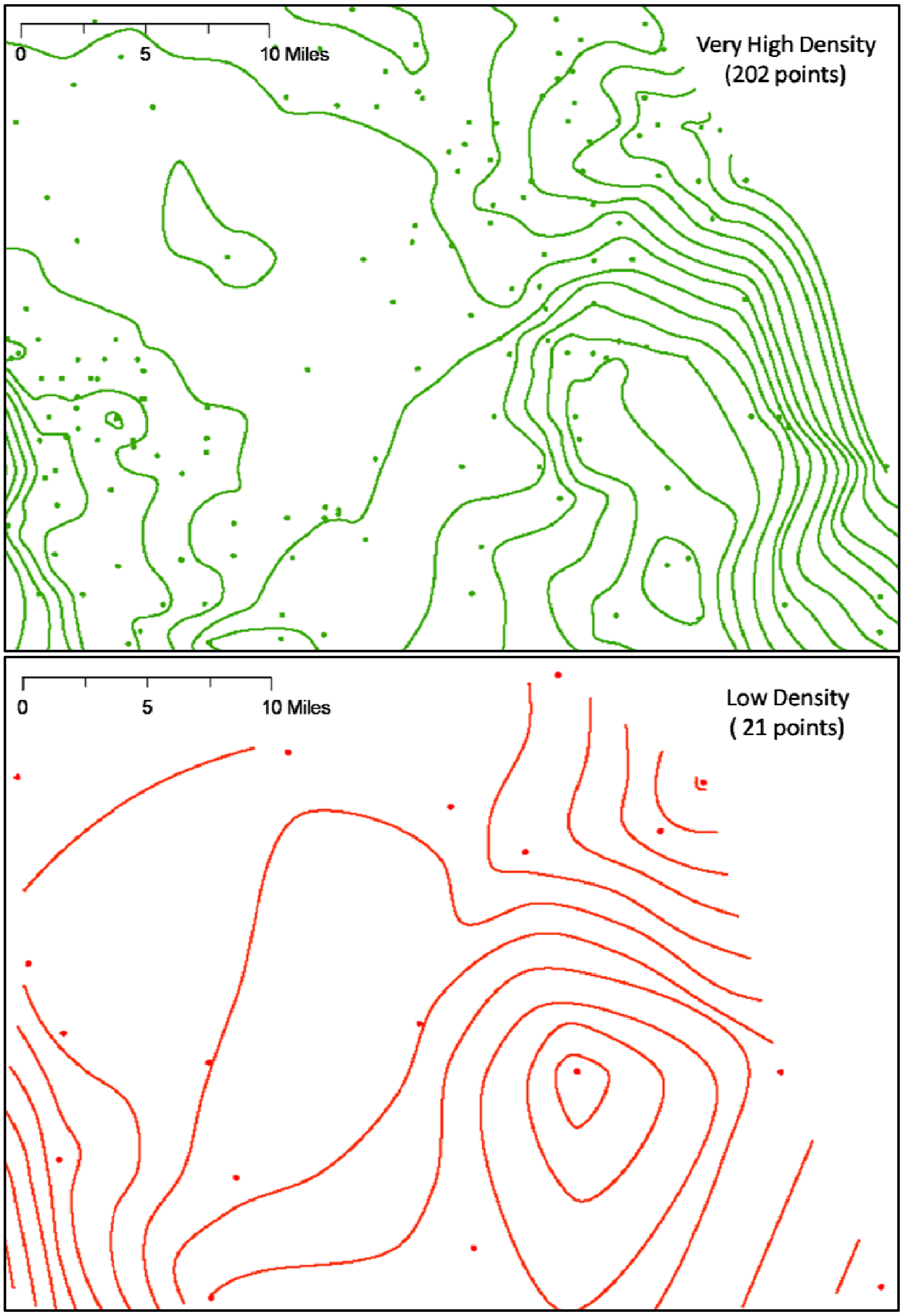

Figure 1. Contour maps – Contours of a very high-density well network (about 20 wells per 100 mi^2) compared to a low-density well network (about 2 wells per 100 mi^2).

FREQUENCY OF WATER-LEVEL MEASUREMENTS

To determine and define seasonal and long-term trends in groundwater levels a consistent measurement frequency must be established. At minimum, semi-annual monitoring of the designated wells in each basin or subbasin should be conducted to coincide with the high and low water-level times of year for each basin. However, quarterly- or monthly-monitoring of wells provides a better understanding of groundwater fluctuations. The DWR office responsible for monitoring a particular basin should use independent judgment to determine when the high and low water-level times occur in a groundwater basin, and to provide a justification for measurement rationale. The semi-annual frequency is a compromise between more frequent measurements (continuous, daily, monthly, or quarterly) and less frequent measurements (annual). A good discussion of water level measurement frequency and other issues related to the design of water-level monitoring programs can be found in the USGS Circular 1217 (Taylor and Alley, 2001).

An example of the effect of different measurement frequencies on the water-level hydrographs in a Northern California well is shown in Figure 2. The data shows that higher-frequency monitoring (e.g., daily or monthly) best captures the seasonal fluctuations in the groundwater levels, quarterly monitoring identifies some of the elevation change, but semi-annual measurements often miss the true seasonal highs and lows.

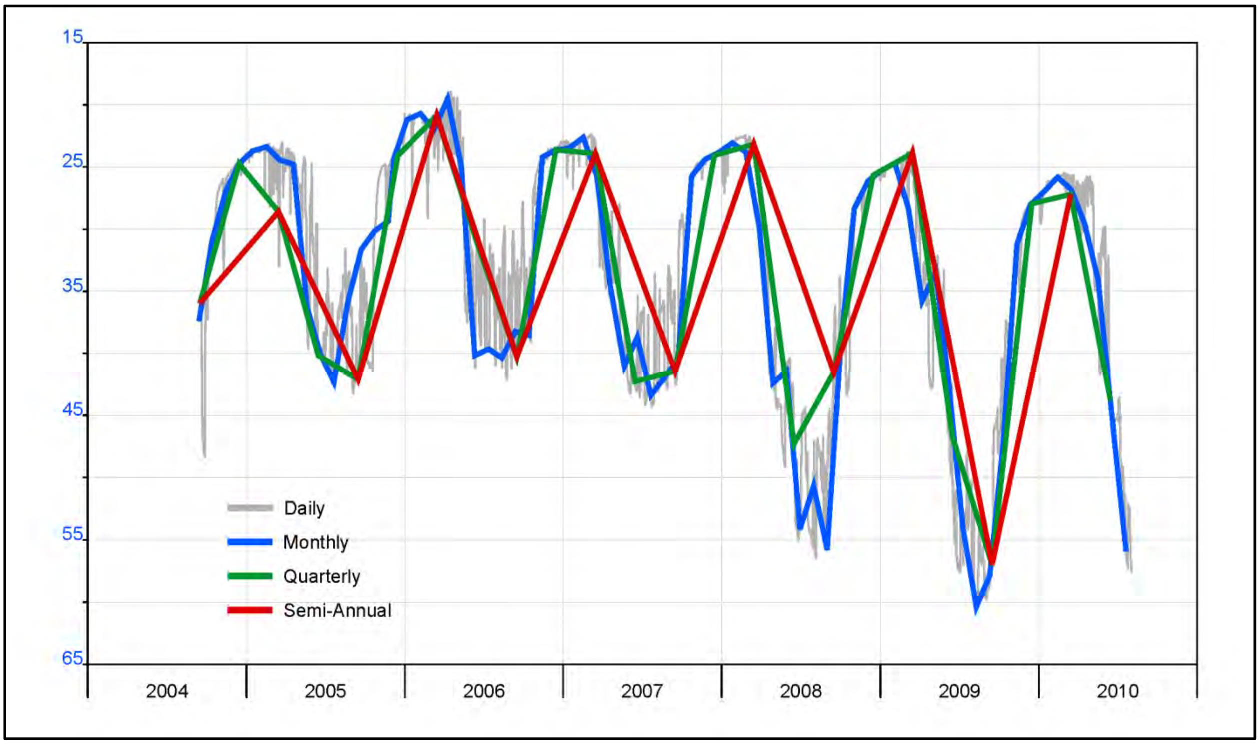

Figure 2. Groundwater Hydrographs – Groundwater elevation changes in a monitoring well over time comparing various measurement frequencies.

The Subcommittee on Ground Water of the Advisory Committee on Water Information generally recommends more frequent measurements than are being required by the CASGEM program; quarterly to annually for aquifers with very few groundwater withdrawals, monthly to quarterly for aquifers with moderate groundwater withdrawals, and daily to monthly for aquifers with many groundwater withdrawals (Table 2). The general effect of environmental factors on the recommended measurement frequency is illustrated in Figure 3.

Measurement Type	**Aquifer Type**	**Nearby Long-Term Aquifer Withdrawals**		
		Very Few Withdrawals	***Moderate Withdrawals***	***Many Withdrawals***
Baseline Measurements	**All aquifer types**	Once per month	Once per day	Once per hour
Surveillance Measurements	**All aquifer types:** "low" hydraulic conductivity (<200 ft/d), "low" recharge (<5 in/yr)	Once per year	Once per quarter	Once per month
	All aquifer types: "high" hydraulic conductivity (>200 ft/d), "high" recharge (>5 in/yr)	Once per quarter	Once per month	Once per day
Data made available to NGWMN	All aquifer types, throughout range of hydraulic conductivity	As stored in local database, but at least annually	As stored in local database, but at least annually	As stored in local database, but at least annually

Table 2. Information on recommended minimum water-level measurement frequency from the Subcommittee on Ground Water of the Advisory Committee on Water Information (2009) (abbreviations: ft/d, feet per day; in/yr, inches per year; NGWMN, National Ground Water Monitoring Network). NOTE: These are not recommendations of the CASGEM program.

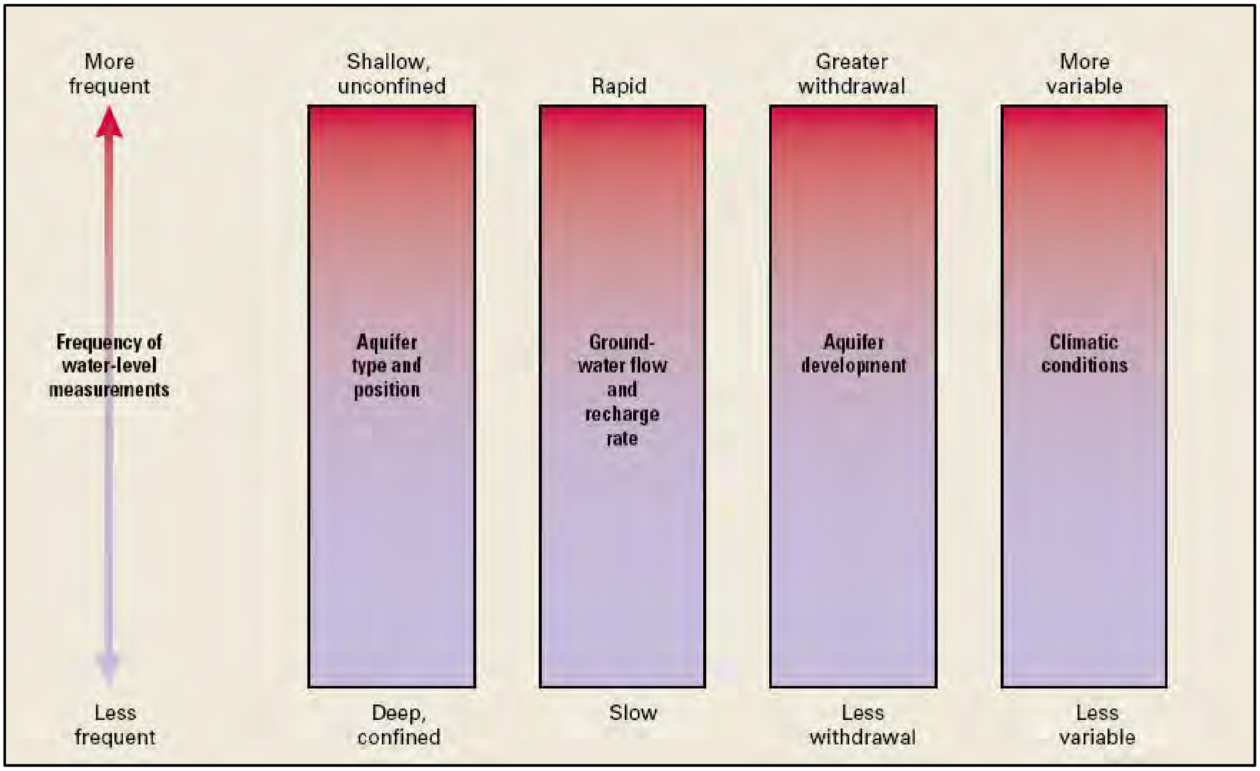

Figure 3. Common environmental factors that influence the choice of frequency of water-level measurements (from Taylor and Alley, 2001).

FIELD GUIDELINES FOR CASGEM WATER-LEVEL MEASUREMENTS

INTRODUCTION

This document presents guidelines for measuring groundwater levels in wells for the CASGEM program to ensure consistency between DWR offices. Following these guidelines will help ensure that groundwater level measurements are accurate and consistent in both unconfined and confined aquifers. Although a well network comprised entirely of dedicated monitoring wells (hereafter referred to as monitoring wells) is preferred, by necessity active production wells used for irrigation or domestic purposes and abandoned production wells that were used for domestic, irrigation, and public supply purposes will also need to be included. **The portions of these guidelines that apply to only production wells will be shown in bold throughout.** DWR does not currently plan to include public supply wells in the CASGEM well networks due to security concerns of the California Department of Public Health.

The main reference used for these guidelines is the United States Geological Survey (USGS) National Field Manual (NFM) (U.S. Geological Survey, 2006). The final report of the Subcommittee on Groundwater (SOGW) of the Advisory Committee on Water Information was also used as a main reference, although in general it relied on the USGS guidelines (Subcommittee on Ground Water of the Advisory Committee on Water Information, 2009). The water-level measurement portion of the USGS guidelines were written for monitoring wells and not for production wells (Taylor and Alley, 2001; U.S. Geological Survey, 2006). Thus, although the USGS guidelines have been adopted with only minor modifications for the monitoring well guidelines of the CASGEM program, additional modifications have been incorporated in the guidelines for production wells. **The most significant changes made to the USGS guidelines for production wells are: (1) reducing the required precision for consecutive depth to water measurements, (2) checking for obstructions in the well, and (3) not attaching weights to the steel tape so as not to hang up on obstructions.**

The guidelines presented in this document are for the use of steel tape, electric sounding tape, sonic water-level meters, or pressure transducers. Although the semi-annual measurements required by the CASGEM program can be satisfied with the use of a steel or electric sounding tape or sonic meter, a pressure transducer with a data logger provides a much better picture of what is happening with water levels over time. The use of the air-line or flowing-well methods should not be needed in most basins. However, if they are, guidelines for these methods are available in sections A4-B-4 (pages B17-B20) and A4-B-5 (pages B21-B24), respectively of the NFM (U.S. Geological Survey, 2006).

Establishing the Reference Point

Water-level measurements from a given well must be referenced to the same datum (the reference point, or RP) to ensure data comparability (see Figure 4). For monitoring wells, the RP should be marked on the top of the well casing. For production wells, the RP will most likely be the top of the access tube or hole to the well casing. The RP must be as permanent as possible and be clearly visible and easily located. It can be marked with a permanent marker, paint, imprinting a mark with a chisel or punch, or by cutting a slot in the top of the casing. In any case, the location of the RP should be clearly described on DWR Form 429 (see Table 3). A photograph of the RP, with clear labeling, should be included in the well folder. In some cases, it may be valuable to establish multiple RPs for a well, depending on the consistent accessibility of the primary RP. In this case, each RP should be clearly described on DWR Form 429 and labeled in the field. The RP should be established with the following coordinate system: horizontal location (decimal latitude and longitude referenced to the North American Datum of 1983; NAD83) and vertical elevation (referenced to the North American Vertical Datum of 1988; NAVD88, in feet).

The land-surface datum (LSD) is established by the person making the initial water-level measurement at the well. The LSD is chosen to represent the average elevation of the ground around the well. Because LSD around a well may change over time, the distance between the RP and LSD should be checked every 3 to 5 years. If appropriate, a concrete well pad or well vault may be chosen as the LSD, since they will be more permanent than the surrounding ground surface.

The elevation of the RP can be determined in several ways: (1) surveying to a benchmark, (2) using a USGS 7.5' quadrangle map, (3) using a digital elevation model (DEM), or (4) using a global positioning system (GPS). While surveying is the most accurate (± 0.1 ft), it is also the most expensive. Depending on the distance to the nearest benchmark, the cost can be prohibitive. The latitude and longitude of the well can be established accurately using a handheld GPS. From this information, the LSD can be located on a USGS quadrangle and the elevation estimated. However, the accuracy is only about ± one half of the contour interval. Thus, for a contour interval of 5 feet, the accuracy of the elevation estimate would be about ± 2.5 feet. The contour interval of high quality DEMs is currently about 30 feet. Therefore, the accuracy of using

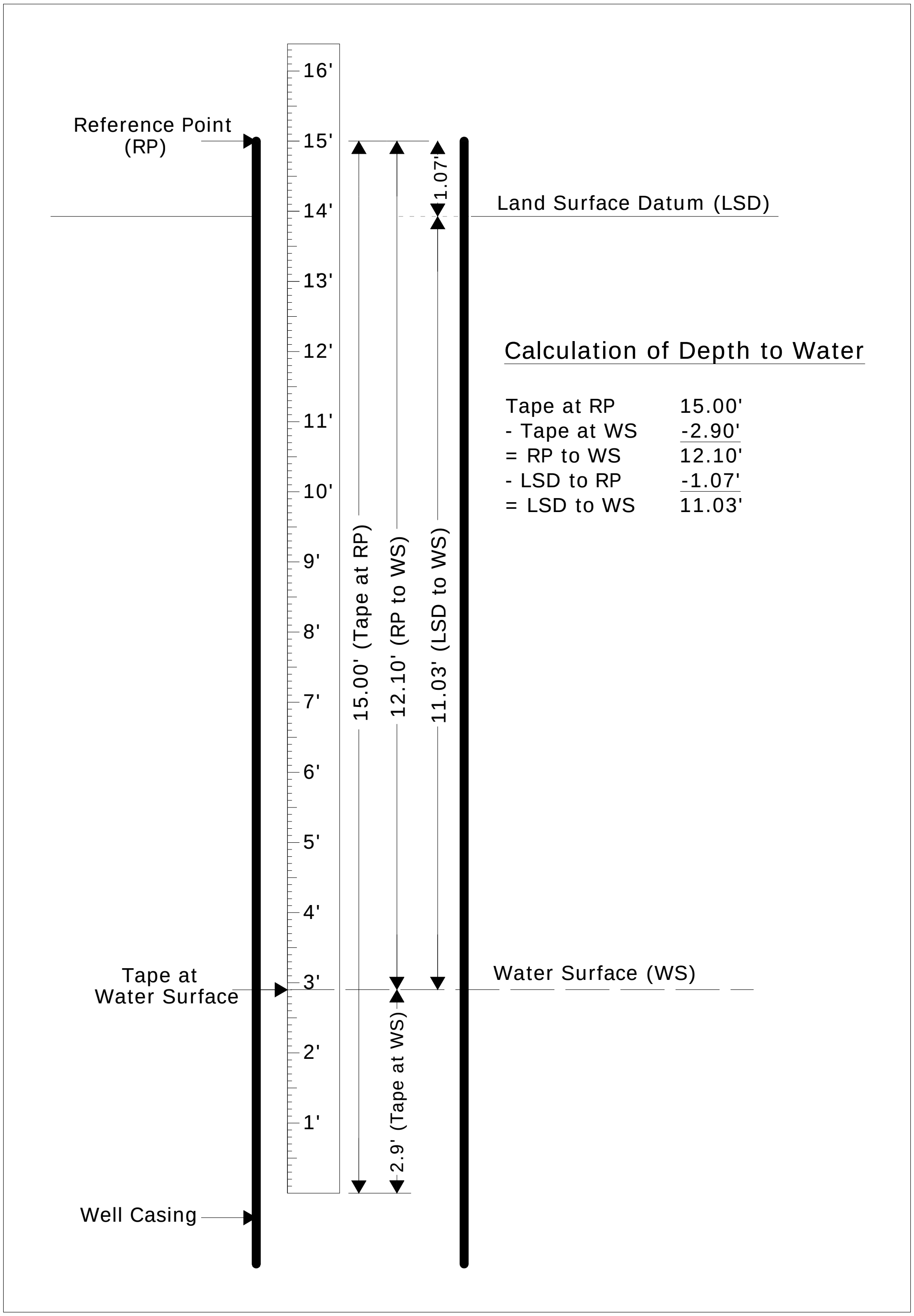

Figure 4. Groundwater-level measurements using a graduated steel tape (modified from U.S. Geological Survey, 2006).

State of California | DEPARTMENT OF WATER RESOURCES | California Natural Resources Agency

WELL DATA

State No. ______________________

District ______________________

OWNER			STATE NO.	
ADDRESS			OTHER NO.	
TENANT				
ADDRESS				
TYPE OF WELL	☐ SPECIAL STUDIES	☐ MONTHLY	☐ SEMI ANNUAL	☐ WATER QUALITY
LOCATION: COUNTY	BASIN		NO.	
U.S.G.S. QUAD.			QUAD NO.	
1/4	1/4 SECTION	TWP.	RGE.	MD ☐ SB BASE & MERIDIAN H ☐
COORDINATES X:	Y:		SOURCE:	
DESCRIPTION				
REFERENCE POINT DESCRIPTION				
WHICH IS FT.	ABOVE ☐ BELOW ☐	LAND SURFACE.	GROUND ELEVATION	FT.
REFERENCE POINT ELEVATION FT.	DETERMINED FROM			
WELL: USE	CONDITION		DEPTH FT.	
CASING, SIZE IN.,	PERFORATIONS			

MEASUREMENTS BY: ☐ DWR ☐ USGS ☐ USBR ☐ COUNTY ☐ IRR. DIST. ☐ WATER DIST. ☐ CONS. DIST.

CHIEF AQUIFER: NAME	DEPTH TO TOP AQ.	DEPTH TO BOT. AQ.
TYPE OF MATERIAL	PERM. RATING	THICKNESS
GRAVEL PACKED? ☐ YES ☐ NO	DEPTH TO TOP GR.	DEPTH TO BOT GR.
SUPP. AQUIFER	DEPTH TO TOP AQ.	DEPTH TO BOT. AQ.
DRILLER	DATE DRILLED:	LOG NUMBER:

EQUIPMENT: PUMP, TYPE		MAKE		
SERIAL NO.	SIZE OF DISCHARGE PIPE IN.	WATER ANALYSIS: MIN. (1)	SAN. (2)	H.M. (3)
POWER, KIND	MAKE	WATER LEVELS AVAILABLE: YES (1)	NO	
H.P.	MOTOR SERIAL NO	PERIOD OF RECORD: BEGIN	END	
ELEC. METER NO.	TRANSFORMER NO.	COLLECTING AGENCY:		
YIELD	G.P.M. PUMPING LEVEL FT.	PROD. REC. (1)	PUMP TEST (2)	YIELD (3)

SKETCH	REMARKS
N	
	RECORDED BY:
	DATE:

DWR 429 (Rev. 1/09)

Table 3. General well data form (DWR Form 429).

DEMs to determine the elevation of the LSD is about ± 15 feet. While a handheld GPS unit is not very accurate for determining elevation, more expensive units with the Wide Area Augmentation System can be more accurate. However, GPS readings are subject to environmental conditions, such as weather conditions, overhead vegetative cover, topography, interfering structures, and location. Thus, the most common method of determining the elevation will probably be the use of USGS quadrangles. The method used needs to be identified on DWR Form 429 (Table 3). The important matter is that all measurements at a well use the same RP, as the elevation of that point can be more accurately established at a later date. The equipment and supplies needed for establishing the RP are shown in Table 4.

If possible, establish a clearly displayed reference mark (RM) in a location near the well; for example, a lag bolt set into a nearby telephone pole or set in concrete in the ground. The RM is an arbitrary datum established by permanent marks and is used to check the RP or to re-establish an RP should the original RP be destroyed or need to be changed. Clearly locate the RP and RM on a site sketch that goes into the well folder (see Table 3). Include the distance and bearing between the RP and the RM and the height of the lag bolt above the ground surface. Photograph the site, including the RP and RM locations; draw an arrow to the RP and RM on the photograph(s) using an indelible marker, and place the photos in the well file.

Table 4. Equipment and Supply List

Equipment and supplies needed for (a) all measurements, (b) establishing permanent RP, (c) steel tape method, (d) electric sounding tape method, (e) sonic water-level meter, and (f) automated measurements with pressure transducer.
(a) All measurements
GPS instrument, digital camera, watch, calculator, and maps
General well data form (DWR Form 429; see Table 3)
Pens, ballpoint with non-erasable blue or black ink, for writing on field forms and equipment log books
Well file with previous measurements
Measuring tape, graduated in feet, tenths, and hundredths of feet
Two wrenches with adjustable jaws and other tools for removing well cap
Key(s) for opening locks and clean rags
(b) Establishing a permanent reference point
Steel tape, graduated in feet, tenths, and hundredths of feet
Calibration and maintenance log book for steel tape
Paint (bright color), permanent marker, chisel, punch, and(or) casing-notching tool

Table 4. Equipment and Supply List (continued)

(c) Steel tape method
DWR field form 1213 (see Table 5)
Steel tape, graduated in feet, tenths, and hundredths of feet
Calibration and maintenance log book for steel tape
Weight (stainless steel, iron, or other noncontaminating material – do not use lead)
Strong ring and wire, for attaching weight to end of tape. Wire should be strong enough to hold weight securely, but not as strong as the tape, so that if the weight becomes lodged in the well the tape can still be pulled free.
Carpenters' chalk (blue) or sidewalk chalk
Disinfectant wipes, and deionized or tap water for cleaning tape.
(d) Electric sounding tape method
DWR field form 1213 (see Table 5)
Steel tape, graduated in feet, tenths, and hundredths of feet
An electric tape, double-wired and graduated in feet, tenths, and hundredths of feet, accurate to 0.01 ft. Electric sounding tapes commonly are mounted on a hand-cranked and powered supply reel that contains space for the batteries and some device ("indicator") for signaling when the circuit is closed.
Electric-tape calibration and maintenance log book; manufacturer's instructions.
Disinfectant wipes, and deionized or tap water for cleaning tape.
Replacement batteries, charged.
(e) Sonic water-level meter method
DWR field form 1213 (see Table 5)
Temperature probe with readout and cable
Sonic water-level meter with factory cover plate
Custom sized cover plates for larger well diameters
Replacement batteries
(f) Automated measurements with pressure transducer
Transducer field form (see Figures 1 and 2 in Drost, 2005: http://pubs.usgs.gov/of/2005/1126/pdf/ofr20051126.pdf)
Transducer, data logger, cables, suspension system, and power supply.
Data readout device (i.e., laptop computer loaded with correct software) and data storage modules.
Spare desiccant, and replacement batteries.
Well cover or recorder shelter with key.
Steel tape (with blue carpenters' chalk or sidewalk chalk) or electric sounding tape, both graduated in hundredths of feet.
Tools, including high-impedance (digital) multimeter, connectors, crimping tool, and contact-burnishing tool or artist's eraser.

GUIDELINES FOR MEASURING WATER LEVELS

Monitoring wells typically have a cap on the wellhead. After the cap is removed, the open top of the well is easily accessible for sampling water levels and water quality. If the well is to be sampled for water quality in addition to water level, the water-level measurement should be made before the well is purged. Before discussing the detailed measurement steps for different methods, some guidance is provided on the common issues of well caps, recovery time after pumping, and cascading water in a well.

Well caps are commonly used in monitoring wells to prevent the introduction of foreign materials to the well casing. There are two general types of well caps, vented and unvented. Vented well caps allow air movement between the atmosphere and the well casing. Unvented well caps provide an airtight seal between the atmosphere and the well casing.

In most cases it is preferred to use vented well caps because the movement of air between the atmosphere and the well casing is necessary for normal water level fluctuation in the well. If the cap is not vented the fluctuation of groundwater levels in the well will cause increased or decreased air pressure in the column of air trapped above the water in the casing. The trapped air can prevent free movement of the water in the casing and potentially impact the water level that is measured. Vented caps will allow both air and liquids into the casing so they should not be used for wells where flooding with surface water is anticipated or contamination is likely from surface sources near the well.

Unvented well caps seal the top of the well casing and prevent both air and liquid from getting into the well. They are necessary in areas where it is anticipated that the well will be flooded from surface water sources or where contamination is likely if the casing is not sealed. Because the air above the water in the casing is trapped in the casing and cannot equalize with the atmospheric pressure, normal water level fluctuation may be impeded. When measuring a well with an unvented cap it is necessary to remove the cap and wait for the water level to stabilize. The wait time will vary with many different factors, but if several sequential water-level measurements yield the same value it can be assumed the water level has stabilized.

Unlike monitoring wells, production wells have obstructions in the well unless it is an abandoned production well and the pump has been removed. In addition, the wellhead is not always easily accessible for monitoring water levels. Since pumping from the production wells will create a non-static water level, the water-level measurement should ideally not be made until the water level has returned to static level. However, this recovery time will vary from site to site. Some wells will recover from pumping level to static level within a few hours, while many wells will take much longer to recover. Some wells will recover from pumping level to static level within a few hours, while many wells will take much longer to recover. Thus, as a general recommendation, measurements should not be collected until 24 hours after pumping has ceased, however, site specific

conditions may require deviating from this. The time since pumping should be noted on the field form.

Water may enter a well above the water level, drip or cascade down the inside of the well, and lead to false water level measurements. Sometimes cascading water can be heard dripping or flowing down the well and other times it is discovered when water levels are abnormally shallow and/or difficult to determine. Both steel tapes and electric sounding tapes can give false readings. A steel tape may be wet from the point where water is entering the well making it hard to see the water mark where the tape intersects the water level in the well. An electric sounding tape signal may start and then stop as it is lowered down the well. If this happens, you can lightly shake the tape. The signal often becomes intermittent when water is running down the tape, but remains constant in standing water. On most electric sounding tapes, the sensitivity can be turned down to minimize false readings. It should be noted when a water level measurement is taken from a well with cascading water.

(1) Steel Tape Method

The graduated steel-tape (wetted-tape) procedure is considered to be the most accurate method for measuring water levels in nonflowing wells. A graduated steel tape is commonly marked to 0.01 foot. When measuring deep water levels (>500 ft), thermal expansion and stretch of the steel tape starts to become significant (Garber and Koopman, 1968). The method is most accurate for water levels less than 200 feet below land surface. The equipment and supplies needed for this method are shown in Table 4.

The following issues should be considered with this method:

- It may be difficult or impossible to get reliable results if water is dripping into the well or condensing on the well casing.
- If the well casing is angled, instead of vertical, the depth to water should be corrected, if possible. This correction should be recorded in the field folder.
- **Check that the tape is not hung up on obstructions.**

Before making a measurement:

1. Maintain the tape in good working condition by periodically checking the tape for rust, breaks, kinks, and possible stretch. Record all calibration and maintenance data associated with the steel tape in a calibration and maintenance log book.

2. If the steel tape is new, be sure that the black sheen on the tape has been dulled so that the tape will retain the chalk.

3. Prepare the field forms (DWR Form 1213; see Table 5). Place any previous measured water-level data for the well into the field folder.

4. Check that the RP is clearly marked on the well and accurately described in the well file or field folder. If a new RP needs to be established, follow the procedures above.

5. In the field, wipe off the lower 5 to 10 feet of the tape with a disinfectant wipe, rinse with de-ionized or tap water, and dry the tape.

6. If possible, attach a weight to the tape that is constructed of stainless steel or other noncontaminating material to protect groundwater quality in the event that the weight is lost in the well. **Do not attach a weight for production wells.**

Making a measurement:

1. If the water level was measured previously at the well, use the previous measurement(s) to estimate the length of tape that should be lowered into the well. Preferably, use measurements that were obtained during the same season of the year.

2. Chalk the lower few feet of the tape by pulling the tape across a piece of blue carpenter's chalk or sidewalk chalk (the wetted chalk mark identifies that part of the tape that was submerged).

3. Slowly lower the weight (for monitoring wells only) and tape into the well to avoid splashing when the bottom end of the tape reaches the water. Develop a feel for the weight of the tape as it is being lowered into the well. A change in this weight will indicate that either the tape is sticking to the side of the casing or has reached the water surface. Continue to lower the end of the tape into the well until the next graduation (a whole foot mark) is at the RP and record this number on DWR Form 1213 (Table 5) next to "Tape at RP" as illustrated on Figure 4.

4. Rapidly bring the tape to the surface before the wetted chalk mark dries and becomes difficult to read. Record the number to the nearest 0.01 foot in the column labeled as "Tape at WS."

5. If an oil layer is present, read the tape at the top of the oil mark to the nearest 0.01 foot and use this value for the "Tape at WS" instead of the wetted chalk mark. Mark an "8" in the QM column of DWR Form 1213 (see Table 5) to indicate a questionable measurement due to oil in the well casing. There are methods to correct for oil, such as the use of a relatively inexpensive water-finding paste. The paste is applied to the lower end of the steel tape and the top of the oil shows as a wet line and the top of the water shows as a distinct color change. Since oil density is about three-quarters that of water, the water level can be estimated by adding three-quarters of the thickness of the oil layer to the oil-water interface elevation (U.S. Geological Survey, 2006).

6. Subtract the “Tape at WS” number from the “Tape at RP” number and record the difference (to the nearest 0.01 ft) as “RP to WS”. This reading is the depth to water below the RP.

7. Wipe and dry off the tape and re-chalk based on the first measurement.

8. Make a second measurement by repeating steps 3 through 5, recording the time of the second measurement on the line below the first measurement (Table 5). The second measurement should be made using a different “Tape at RP” than that used for the first measurement. If the second measurement does not agree with the original within 0.02 of a foot **(0.2 of a foot for production wells)**, make a third measurement, recording this measurement and time on the row below the second measurement with a new time. If more than two readings are taken, record the average of all reasonable readings.

After making a measurement:

1. Clean the exposed portion of the tape using a disinfectant wipe, rinse with de-ionized or tap water, and dry the tape. Do not store a steel tape while dirty or wet.

GROUNDWATER LEVEL DATA FORM
MANUAL MEASUREMENTS

WELL ID NUMBER	WELL NAME	STATE WELL NUMBER	COUNTY	B-118 BASIN OR SUBBASIN	MEASURING AGENCY	LAND SURFACE DATUM (LSD) ELEV.	RP TO LAND SURFACE DATUM (LSD), IN FT	REFERENCE POINT (RP) ELEV.

NO MEASUREMENT (NM)
0. Measurement discontinued
1. Pumping
2. Pump house locked
3. Tape hung up
4. Can't get tape in casing
5. Unable to locate well
6. Well has been destroyed
7. Special
8. Casing leaky or wet
9. Temporarily inaccessible

QUESTIONABLE MEASUREMENT (QM)
0. Caved or deepened
1. Pumping
2. Nearby pump operating
3. Casing leaky or wet
4. Pumped recently
5. Air or pressure gauge measurement
6. Other
7. Recharge operation at or nearby well
8. Oil in casing

MEASUREMENT METHOD (MM)
0. Steel tape
1. Electric sounding tape
2. Other

DATE	TIME	N M	Q M	MM	TAPE at RP	TAPE at WS	RP to WS	LSD to WS	OBS	COMMENTS

[For explanation of terms, see figure 1.]

DWR Form 1213 (modified 6/28/2010) (data for Water Data Library)

Table 5. Groundwater level data form for manual measurements (DWR Form 1213).

(2) Electric Sounding Tape Method

The electric sounding tape procedure for measuring depth to the water surface is especially useful in wells with dripping water or condensation, although there are still precautions needed as noted in the beginning of this section. Other benefits of this method include:

- Easier and quicker than steel tapes, especially with consecutive measurements in deeper wells.
- Better than steel tapes for making measurements in the rain.
- Less chance for cross-contamination of well water than with steel tapes, as there is less tape submerged.

The accuracy of electric sounding tape measurements depends on the type of tape used and whether or not the tape has been stretched out of calibration after use. Tapes that are marked the entire length with feet, tenths, and hundredths of a foot should be read to 0.01 ft. Electric sounding tapes are harder to keep calibrated than are steel tapes. As with steel tapes, electric sounding tapes are most accurate for water levels less than 200 ft below land surface, and thermal expansion and stretch start to become significant factors when measuring deep water levels (>500 ft) (see Garber and Koopman, 1968). Equipment and supplies needed for this method are shown in Table 4.

The following issues should be considered with this method:

- If the well casing is angled, instead of vertical, the depth to water will have to be corrected, if possible. This correction should be recorded in the field folder.
- **Check that the electric sounding tape is not hung up on an obstruction in the well.**
- The electric sounding tape should be calibrated annually against a steel tape in the field (using monitoring wells only) as follows: Compare water-level measurements made with the electric sounding tape to those made with a steel tape in several wells that span the range of depths to water encountered in the field. The measurements should agree to within ± 0.02 ft. If this accuracy is not met, a correction factor should be applied. All calibration and maintenance data should be recorded in a calibration and maintenance log book for the electric sounding tape.
- **Oil on the surface of the water may interfere with obtaining consistent readings and could damage the electrode probe. If oil is present, switch to a steel tape for the water-level measurement.**
- If using a repaired/spliced tape: see section A4-B-3(b) (page B16) of the NFM (U.S. Geological Survey, 2006).

Before making a measurement:

1. Inspect the electric sounding tape and electrode probe before using it in the field. Check the tape for wear, kinks, frayed electrical connections and possible stretch; the

cable jacket tends to be subject to wear and tear. Test that the battery and replacement batteries are fully charged.

2. Check the distance from the electrode probe's sensor to the nearest foot marker on the tape, to ensure that this distance puts the sensor at the zero foot point for the tape. If it does not, a correction must be applied to all depth-to-water measurements. Record this in an equipment log book and on the field form.

3. Prepare the field forms (DWR Form 1213; see Table 5) and place any previous measured water-level data for the well into the field folder.

4. After reaching the field site, check that the RP is clearly marked on the well and is accurately described in the well file or field folder. If a new RP needs to be established, follow the procedures above.

5. Check the circuitry of the electric sounding tape before lowering the electrode probe into the well. To determine proper functioning of the tape mechanism, dip the electrode probe into tap water and observe whether the indicator needle, light, and/or beeper (collectively termed the "indicator" in this document) indicate a closed circuit. For an electric sounding tape with multiple indicators (sound and light, for instance), confirm that the indicators operate simultaneously. If they do not operate simultaneously, determine which is the most accurate and use that one.

6. Wipe off the electrode probe and the lower 5 to 10 feet of the tape with a disinfectant wipe, rinse with de-ionized or tap water, and dry.

Making a measurement:

1. If the water level was measured previously at the well, use the previous measurement(s) to estimate the length of tape that should be lowered into the well. Preferably, use measurements that were obtained during the same season of the year.

2. Lower the electrode probe slowly into the well until the indicator shows that the circuit is closed and contact with the water surface is made. Avoid letting the tape rub across the top of the well casing. Place the tip or nail of the index finger on the insulated wire at the RP and read the depth to water to the nearest 0.01 foot. Record this value in the column labeled "Tape at RP", with the appropriate measurement method code and the date and time of the measurement (see Table 5).

3. Lift the electrode probe slowly up a few feet and make a second measurement by repeating step 2 and record the second measurement with the time in the row below the first measurement in Table 5. Make all readings using the same deflection point on the indicator scale, light intensity, or sound so that water levels will be consistent between measurements. If the second measurement does not agree with the first measurement within 0.02 of a foot **(0.2 of a foot for production wells)**, make a third measurement,

recording this measurement with the time in the row below the second measurement. If more than two readings are taken, record the average of all reasonable readings.

After making a measurement:

1. Wipe down the electrode probe and the section of the tape that was submerged in the well water, using a disinfectant wipe and rinse thoroughly with de-ionized or tap water. Dry the tape and probe and rewind the tape onto the tape reel. Do not rewind or otherwise store a dirty or wet tape.

(3) Sonic Water-Level Meter Method

This meter uses sound waves to measure water levels. It requires an access port that is 5/8 – inch or greater in diameter and measurement of the average air temperature in the well casing. The meter can be used to quickly measure water levels in both monitoring wells and production wells. Also, since this method does not involve contact of a probe with the water, there is no concern over cross contamination between wells. However, the method is not as accurate as the other methods, with a typical accuracy of 0.2 ft for water levels less than 100 ft or 0.2% for water levels greater than 100 ft. Equipment and supplies needed for this method are shown in Table 4.

The following issues should be considered with this method:

- The accuracy of the meter decreases with well diameter and should not be used with well diameters greater than 10 inches.
- An accurate air temperature inside the well casing is necessary so that the variation of sound velocity with air temperature can be accounted for.
- **Obstructions in the well casing can cause erroneous readings, especially if the obstruction is close to half the well diameter or more.**

Before making a measurement:

1. Check the condition of the meter, especially the batteries. Take extra batteries to the field.

2. Take a temperature probe with a readout and 50-ft cable.

3. If open wellheads with diameter greater than the factory cover plate and less than 10 inches will be monitored, fabricate appropriately-sized cover plates using plastic or sheet metal.

4. Prepare the field forms (DWR Form 1213; see Table 5). Place any previous measured water-level data for the well into the field folder.

5. Check that the RP is clearly marked on the well and accurately described in the well file or field folder. If a new RP needs to be established, follow the procedures above.

Making a measurement:

1. If the water level was measured previously at the well, lower the temperature probe to about half that distance in the well casing. Preferably, use measurements that were obtained during the same season of the year.

2. Record this temperature in the comments column of DWR form 1213 (see Table 5). Use this temperature reading to adjust the temperature toggle switch on the sonic meter.

3. Select the appropriate depth range on the sonic meter.

4. For a covered wellhead, insert the meter duct into the access port and push the power-on switch. Record the depth from the readout.

5. For an open wellhead, slip the provided cover plate onto the wellhead to provide a seal. If the cover plate is not large enough, use a fabricated cover plate for diameters up to 10 inches. Record the depth from the readout.

After making a measurement:

1. Make sure the temperature probe and the sonic meter are turned off and put away in their cases.

(4) Pressure Transducer Method

Automated water-level measurements can be made with a pressure transducer attached to a data logger. Care should be taken to choose a pressure transducer that accurately measures the expected range of groundwater levels in a well. Pressure-transducer accuracy decreases linearly with increases in the depth range (also known as pressure rating). A pressure transducer with a depth range of 0 to 10 ft (0 to 4.3 psi) has an accuracy of 0.01 ft while a pressure transducer with a depth range of 0 to 100 ft (0 to 43 psi) has an accuracy of 0.1 ft. But if the measurement range exceeds the depth range of a pressure transducer, it can be damaged. So it is important to have a good idea of the expected range of groundwater levels in a well, and then refer to the manufacturer's specification when selecting a pressure transducer for that well.

Some of the advantages of automated monitoring include:

- No correction is required for angled wells, as pressure transducers only measure vertical water levels.
- A data logger can be left unattended for prolonged periods until data can be downloaded in the field.
- Downloaded data can be imported directly into a spreadsheet or database.

Some of the disadvantages of automated monitoring include:

- It may be necessary to correct the data for instrument drift, hysteresis, temperature effects, and offsets. Most pressure transducers have temperature compensation built-in.
- Pressure transducers operate only in a limited depth range. The unit must be installed in a well in which the water level will not fluctuate outside the operable depth range for the specific pressure transducer selected. Wells with widely fluctuating water levels may be monitored with reduced resolution or may require frequent resetting of the depth of the pressure transducer.
- With some data loggers, previous water-level measurements may be lost if the power fails.

There are two types of pressure transducers available for measuring groundwater levels; non-vented (absolute) and vented (gauged). A non-vented pressure transducer measures absolute pressure, is relative to zero pressure, and responds to atmospheric pressure plus pressure head in a well (see Figure 5). A vented pressure transducer measures gauge pressure, is relative to atmospheric pressure, and only responds to pressure head in a well.

Non-vented pressure transducer data require post processing. Barometric pressure data must be collected at the same time as the absolute pressure data at the well, and subtracted from each absolute pressure data record before the data can be used to calculate groundwater levels. Thus, if a non-vented pressure transducer is used, a barometric pressure transducer will also be needed near the well. This subject is usually covered in more detail by the manufacturer of the pressure transducer. In an area with little topographic relief, a barometer at one site should be sufficient for use by other sites within a certain radius (9 miles reported by Schlumberger http://www.swstechnology.com/ groundwater-monitoring/groundwater-dataloggers/baro-diver and 100 miles reported by Global Water http://www.globalw.com/support/barocomp.html). In an area of significant topographic relief, it would be advisable to have a barometer at each site.

Vented pressure transducers can be programmed so no post processing of the data is necessary. The vent is usually a small tube in the communication cable that runs from the back of the pressure transducer to the top of the well. This vent enables the pressure transducer to cancel the effect of atmospheric pressure and record groundwater level as the distance from the RP to the WS (see Figure 5). However, if the vent is exposed to excessive moisture or submerged in water it can cause failure and damage to the pressure transducer.

The existing well conditions should be considered when deciding which type of pressure transducer to use. Non-vented pressure transducers should be used when the top of a well or its enclosure may at any time be submerged in water. This can happen when artesian conditions have been observed or are likely, the well is completed at or below the LSD, or the well or its enclosure are susceptible to periods of high water. Otherwise, it is advisable to use a vented pressure transducer.

The following guidelines are USGS guidelines from Drost (2005) and Freeman and others (2004) for the use of pressure transducers. These USGS guidelines have not been incorporated as yet in the NFM. The equipment and supplies needed for automated measurements of water level using a pressure transducer are shown in Table 4.

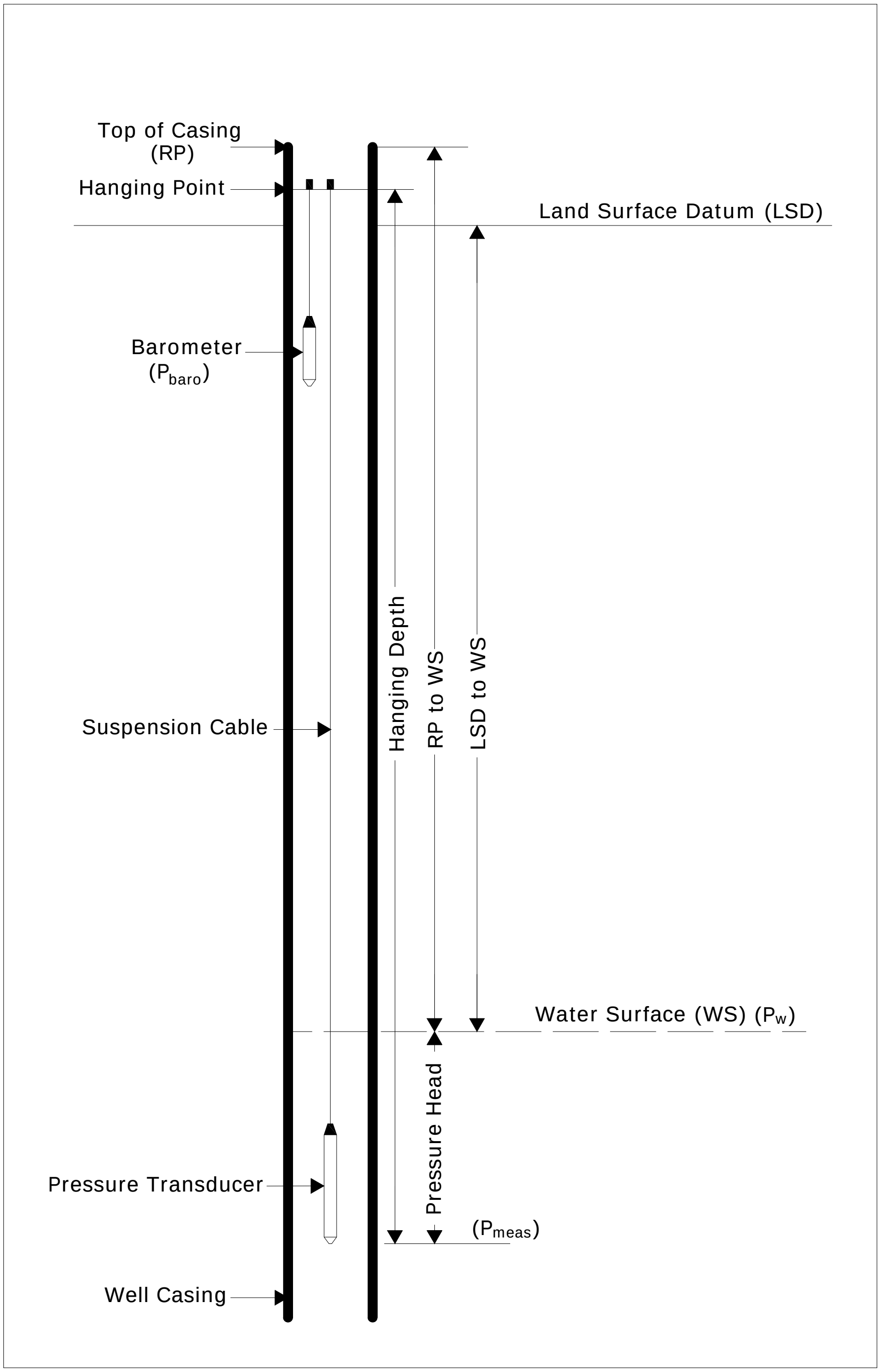

Figure 5. Groundwater-level measurements using a pressure transducer (vented or non-vented) (modified from Drost, 2005).

Before making a measurement:

1. Keep the pressure transducer packaged in its original shipping container until it is installed.

2. Fill out the DWR field form (Table 6), including the type, serial number, and range of measurement device; and what units are being measured (ft, psi).

3. Take a reading from the pressure transducer before placing into the well. For a vented pressure transducer the reading should be zero. For a non-vented pressure transducer the reading should be a positive number equivalent to atmospheric pressure. Configure the units (ft, psi) on a barometric pressure transducer the same as the non-vented pressure transducer. A reading from the barometric pressure transducer should be the same as the non-vented pressure transducer reading.

4. Lower the pressure transducer into the well slowly. Conduct a field calibration of the pressure transducer by raising and lowering it over the anticipated range of water-level fluctuations. Take two readings at each of five intervals, once during the raising and once during the lowering of the pressure transducer. Record the data on the DWR field form (see Table 6). If using a non-vented pressure transducer, take a reading from the barometric pressure transducer at the same time as the other readings.

5. Lower the pressure transducer to the desired depth below the water level (caution: do not exceed the depth range of the pressure transducer).

6. Fasten the cable or suspension system to the well head using tie wraps or a weatherproof strain-relief system. If the vent tube is incorporated in the cable, make sure not to pinch the cable too tightly or the vent tube may be obstructed.

7. Make a permanent mark on the cable at the hanging point, so future slippage, if any, can be determined.

8. Measure the static water level in the well with a steel tape or electric sounding tape. Repeat if measurements are not consistent within 0.02 ft **(0.2 ft for production wells)**.

9. Record the well and RP configuration, with a sketch. Include the RP height above the LSD, the hanging point, and the hanging depth (see Figure 5).

GROUNDWATER LEVEL DATA FORM
VENTED OR NON-VENTED PRESSURE TRANSDUCER WITH DATALOGGER

Station Information						Transducer Information						
Well ID Number	Well Name	State Well Number	County	Bulletin 118 GW Basin or Subbasin	Measuring Agency	Type of Pressure Transducer -- (A) Gauged (vented) or (B) Absolute (non-vented)?	Manufac-turer	Model	Serial Number	PSI Rating	Cable Length	Barometer Serial Number

Datum Measurements (in feet) [Date of Measurements:]

Reference Point (RP) Elevation (MSL) [from DWR Form 429]	RP to Land Surface Datum (LSD)	(1) RP to Hanging Point	(2) Hanging Depth	(3) RP to Pressure Transducer

Manual Readings									Datalogger Readings					Datalogger Servicing			
Date	Time	Obser-ver	NM	QM	MM	(4) Tape at RP	(5) Tape at WS	(6) RP to WS	(7) Transducer pressure (psi)	(8) Barometric pressure (psi)	(9) WS pressure (psi)	(10) WS above transducer (ft)	(11) RP to WS (ft)	Test Name	Download-ed data? (Y/N)	Batt. life left / new batteries? (%; Y/N)	Comments

These cells only need to be filled out for non-vented transducers (which will have a barometer at the well in addition to the transducer)

Notes about calculated entries in form (referenced by number in cell): (3) = (1) + (2); (6) = (4) - (5) for steel tape; (6) = (4) for electric sounding tape; (9) = (7) - (8) for non-vented transducer; (9) = (7) for vented transducer; (10) = 2.3067 * (9); (11) = (3) - (10) [for explanation of terms, see figure 2]

NM (No Measurement) Codes: 0--Measurement discontinued 1--Pumping 2--Pump house locked 3--Tape hung up 4--Can't get tape in casing 5--Unable to locate well 6--Well has been destroyed 7--Special 8--Casing leaky or wet 9--Temporarily inaccessible

QM (Questionable Measurement) Codes: 0--Caved or deepened 1--Pumping 2--Nearby pump operating 3--Casing leaky or wet 4--Pumped recently 5--Air or pressure gauge measurement 6--Other 7--Recharge operation at or nearby well 8--Oil in casing

MM (Measurement Method) Codes: 0--Steel tape 1--Electric sounding tape 2--Other

DWR Form xxxx (data for Hydstra)

Table 6. Groundwater level data form for vented or non-vented pressure transducer with data logger.

10. Connect the data logger, power supply, and ancillary equipment. Configure the data logger to ensure the channel, scan intervals, units, etc., selected are correct. Activate the data logger. Most data loggers will require a negative slope in order to invert water levels for ground-water applications (i.e., distance from the RP to the WS). If using a non-vented pressure transducer the data logger will not require a negative slope, but atmospheric pressure data will need to be collected by a barometric pressure transducer.

Making a measurement:

1. Retrieve water-level data (to 0.01 ft) using instrument or data logger software. If using a non-vented pressure transducer, retrieve barometric pressure data.

2. Measure the water level with a steel tape or electric sounding tape (to 0.01 ft) and compare the reading with the value recorded by the pressure transducer and data logger. Record the reading and time in the file folder. If using a non-vented pressure transducer, subtract the barometric pressure value from the transducer pressure value to obtain the water level pressure value. The water level pressure can then be multiplied by 2.3067 to convert from psi of pressure to feet of water (Freeman and others, 2004). Report the calculated water level to the nearest 0.01 ft.

3. If the tape and pressure transducer readings differ by more than **(the greater of 0.2 ft or)** two times the accuracy of the specific pressure transducer, raise the pressure transducer out of the water and take a reading to determine if the cable has slipped, or whether the difference is due to drift. The accuracy of a pressure transducer is typically defined as 0.001 times the full scale of the pressure transducer (e.g., a 0 to 100 ft pressure transducer has a full scale of 100 ft). The accuracy of a specific pressure transducer should be specified by the manufacturer's specifications.

4. If drift is significant, recalibrate the pressure transducer as described using a steel tape. If using a non-vented pressure transducer, keep the pressure transducer out of the water and calibrate to the barometric pressure transducer value. If field calibration is not successful, retrieve the transducer and send back to the manufacturer for re-calibration.

5. Use the multimeter (see Table 4) to check the charge on the battery, and the charging current supply to the battery. Check connections to the data logger, and tighten as necessary. Burnish contacts if corrosion is occurring.

6. Replace the desiccant, battery (if necessary), and data module. Verify the data logger channel and scan intervals, document any changes to the data logger program and activate the data logger.

7. If possible, wait until data logger has logged a value, and then check for reasonableness of data.

GLOSSARY OF TERMS

The following terms are used in this document. Although many are commonly used in the groundwater- and data-management fields, they are defined here to avoid confusion.

Aquifer – A geologic formation from which useable quantities of groundwater can be extracted. A confined aquifer is bounded above and below by a confining bed of distinctly less permeable material. The water level in a well installed in a confined aquifer stands above the top of the confined aquifer and can be higher or lower than the water table that may be present in the material above it. In some cases, the water level can rise above the ground surface, yielding a flowing well. An unconfined aquifer is one with no confining beds between the saturated zone and the ground surface. The water level in a well installed in an unconfined aquifer stands at the same level as the groundwater outside of the well and represents the water table. An alternative and equivalent definition for an unconfined aquifer is an aquifer in which the groundwater surface is at atmospheric pressure.

Atmospheric or barometric pressure – The force per unit area exerted against a surface by the weight of the air above that surface at any given point in the Earth's atmosphere. At sea level, the atmospheric pressure is 14.7 psi. As elevation increases, atmospheric pressure decreases as there are fewer air molecules above the ground surface. The atmospheric pressure is measured by a barometer. This pressure reading is called the barometric pressure. Weather conditions can increase or decrease barometric pressure.

Blue carpenter's chalk – A primarily calcium carbonate chalk with some silica. It is primarily used to make chalk-lines for long lasting bright marks. Some other formulations of chalk (e.g., sidewalk chalk) substitute different ingredients such as rice starch for silica.

Data logger – A microprocessor-based data acquisition system designed specifically to acquire, process, and store data. Data usually are downloaded from onsite data loggers for entry into office data systems. The storage device within a data logger is called the data module. A desiccant, such as, silica gel, calcium sulfate, or calcium chloride, is used to absorb and keep moisture away from the data module.

Dedicated monitoring well – A well designed for the sole purpose of long-term monitoring.

Domestic well – A water well used to supply water for the domestic needs of an individual residence or systems of four or fewer service connections.

DWR Bulletin 118 – DWR publication on the status of California's groundwater. Prior to this 2003 update, the latest Bulletin 118 was published in 1980. This publication defines the 515 basins to be monitored in the SB 6 monitoring program. The report reference is: California Department of Water Resources, 2003, California's groundwater: Bulletin 118, 246 p., available online at: http://www.water.ca.gov/pubs/groundwater/bulletin_118/california's_groundwater__bulletin_118_-_update_2003_/bulletin118_entire.pdf

Electric sounding tape – This term is used in this document to mean both the electric tape and the electrode probe attached to the end of the tape. This water-level measuring device is also known by many other names, including a sounder, an electric tape, an E tape, an electric sounder, an electric well sounder, a depth sounder, etc.

Electrode probe – This is the electronic sensor in the electronic sounder attached to the end of the electric tape. It senses water based on the electrical conductivity and triggers an alert.

GPS – This stands for global positioning system. These devices come in many sizes and costs. The handheld devices are capable of very accurate locations in the xy plane (latitude longitude). However, only very expensive and large GPS units are currently capable of accurate readings for the altitude (z direction).

Groundwater – Water occurring beneath the ground surface in the zone of saturation.

Groundwater basin – An alluvial aquifer or a stacked series of alluvial aquifers with reasonably well-defined boundaries in a lateral direction and having a definable bottom.

Groundwater elevation – The elevation (generally referenced to mean sea level as the datum) to which water in a tightly cased well screened at a given location will rise. Other terms that may be used include groundwater level, hydraulic head, piezometric head, and potentiometric head.

Groundwater surface – The highest elevation at which groundwater physically occurs in a given location in an aquifer (i.e., top of aquifer formation in a confined aquifer and the groundwater level or water table in an unconfined aquifer). Also referred to as a water surface in this document.

Groundwater subbasin – A subdivision of a groundwater basin created by dividing the basin using geologic and hydrologic conditions or institutional boundaries.

Hysteresis – The maximum difference in output, at any measured value within the specified range, when the value is approached first with an increasing and then a decreasing measured property. Hysteresis is expressed in percent of the full-scale output.

Instrument Drift – A change in instrument output over a period of time that is not a function of the measured property. Drift is normally specified as a change in zero (zero drift) over time and a change in sensitivity (sensitivity drift) over time.

Irrigation well – A well used to irrigate farmland. The water from the well is not intended for domestic purposes.

Metadata – "data about data"; it is the data describing context, content and structure of records and their management through time.

NFM – This stands for National Field Manual. This is a living, online, document of the USGS. It is the protocol document for USGS methods of surface water, groundwater, and water quality field activities. The portion of the NFM that related to the field methods of collecting groundwater levels is in the following reference: U.S. Geological Survey, 2006, Collection of water samples (ver. 2.0): U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A4, September, accessed 12/30/09 at: http://pubs.water.usgs.gov/twri9A4/

Nonflowing well – A well in which the water level is below the land surface.

Pressure head – The height of a column of groundwater above a point that is supported by pressure at that point.

Pressure transducer – A type of measurement device that converts pressure-induced mechanical changes into an electrical signal.

Production well – A well with a pump installed that is used to bring groundwater to the land surface. This is a general term that can be applied to a domestic well, irrigation well, or public-supply well.

Public-supply well – A well that pumps groundwater from a relatively extensive saturated area and is used as part of a public water system, supplying water for human consumption to at least 3,300 people.

SOGW – This stands for Subcommittee on Groundwater. This is a subcommittee of the Advisory Committee on Water Information, which is developing a national framework for groundwater in the United States. The reference for the SOGW work is: Subcommittee on Ground Water of the Advisory Committee on Water Information, 2009, A national framework for ground-water monitoring in the United States: final version approved by the Advisory Committee on Water Information, June 2009, 78 p., accessed 1/11/10 at: http://acwi.gov/sogw/pubs/tr/index.html

Static water level – Groundwater level in a well during non-pumping conditions.

Vent tube – A tube in the cable which connects to the pressure transducer, allowing atmospheric pressure to be in contact with one side of the strain gauge in the pressure sensor. It cancels out the barometric effects in the readings.

Well casing – The metal or plastic pipe separating the well from the surrounding geologic material.

Wellhead – The top of the well containing the casing hanger and the point at which the motor is attached for a vertical line shaft turbine pump or where the seal is secured for a submersible pump.

Well purging – Pumping out standing groundwater from a monitoring well. This is done prior to water quality sampling of wells, but **not** before taking a water-level measurement.

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Appendix B

CASGEM Monitoring Plan Summary

CASGEM Monitoring Plan Summary

The goal of the CASGEM program is to regularly and systematically monitor groundwater elevations that demonstrate seasonal and long-term trends in California's groundwater basins and to make this information readily and widely available to the public. The CASGEM program will rely and build on the many, established local long-term groundwater monitoring and management programs.

In determining what information should be reported to DWR, the department will defer to existing monitoring programs if those programs result in information that demonstrates seasonal and long-term trends in groundwater elevations. Monitoring Entities may submit an existing groundwater monitoring plan that is part of a groundwater adjudication program, an AB3030 program, an IRWM program, or any other groundwater management program that satisfies the goals of CASGEM. If there are future changes in a monitoring plan that is already established with CASGEM, the Monitoring Entity should provide an update to DWR at that time.

Monitoring Plan Overview

Phase 2 of the CASGEM Online Submittal System will be available on May 18, 2011 for prospective Monitoring Entities to submit their groundwater elevation monitoring plans and detailed well information. Each CASGEM monitoring plan should describe the monitoring network and the monitoring plan rationale. The description of the well network should allow users of the CASGEM database to understand well coverage within the basin or subbasin. The monitoring plan rationale explains how the proposed monitoring is designed to capture the seasonal highs and lows and long-term groundwater elevation trends.

The basic components of a CASGEM monitoring plan include the following:

- discussion of the well network,
- map(s) of the well network,
- monitoring schedule,
- description of field methods,
- discussion of the role of cooperating agencies, if applicable, and
- description of the monitoring plan rationale.

The monitoring rationale, which explains how the plan will result in groundwater elevation data that demonstrates seasonal and long-term trends, may discuss any or all of the following information:

- history of groundwater monitoring in the basin,
- principal aquifer features of the basin (for example, multiple aquifers),

- groundwater conditions in the basin (for example, types, locations and timing of recharge and discharge),
- selection of wells for the CASGEM monitoring program (number, depths and distribution of the wells), and
- selection of the monitoring schedule.

If the well network contains any data gaps, the monitoring plan should also discuss the following:

- location and reason for gaps in the well monitoring network,
- local issues and circumstances that limit or prevent groundwater monitoring, and
- recommendations for future well locations (assuming funding for new wells or permission for access to existing wells becomes available).

Maps

The monitoring plan can include maps that show well locations, the boundaries of the area to be monitored and, ideally, the Monitoring Entity's jurisdictional boundary. The optimal density of monitoring locations will depend on the complexity of the basin. If multiple aquifers are present in a basin, maps depicting how each of the aquifers is monitored are useful. The location of gaps in the monitoring network and the location of potential future monitoring wells can also be identified on each map. A table that provides a list of wells could also be used to identify the wells in the network.

Schedule

The monitoring schedule should provide a clear description of the frequency and timing of monitoring. To demonstrate seasonal and long-term trends in groundwater elevations, basin-wide monitoring should be conducted at least twice a year to measure the seasonal high and seasonal low groundwater elevations for the basin. The seasonal high and low groundwater elevations typically occur in early spring and in summer or fall, respectively, but may vary from basin to basin. Monitoring data collected in more frequent intervals can also be submitted to CASGEM. The online system will be designed to accept a maximum frequency of daily measurements for each well. To ensure that each round of monitoring represents a snapshot in time for conditions in the basin or subbasin, it will be important to schedule each round of measurements for all the wells in the network within the narrowest possible window of time. To provide the details of the monitoring schedule, the plan should contain a table detailing the time and frequency of monitoring for each of the wells in the monitoring network.

Field Methods

Field methods are the standard procedures for the collection and documentation of groundwater elevation data. A description of field methods provides an indicator of the quality, consistency and reliability of monitoring data to the users of the CASGEM database. Many Monitoring Entities already have established field methods for their groundwater monitoring programs that meet the following basic requirements:

- step-by-step instructions to establish the Reference Point,
- methods for recording measurements,
- methods to ensure the measurement of static (non-pumping) groundwater conditions,
- step-by-step instructions to measure depth to water, and
- forms for recording measurements.

Each Monitoring Entity will develop and implement monitoring protocols appropriate for the local groundwater basin conditions. Monitoring Entities who do not have established monitoring protocols can request assistance from DWR Region Offices to help develop appropriate protocols.

Well Information

In addition to the monitoring plan, each Monitoring Entity will also input the following detailed well information into the CASGEM Online Submittal System:

- Local well ID and/or State Well Number
- Reference Point Elevation (feet, NAVD88)
- Reference Point description
- Ground Surface Elevation (feet NAVD88)
- Method of determining elevation
- Accuracy of elevation method
- Well Use
- Well Status (active or inactive)
- Well coordinates (decimal lat/long, NAD83)
- Method of determining coordinates
- Accuracy of coordinate method
- Well Completion type (single or multi-completion)
- Total depth (feet)
- Top and bottom of screened intervals (up to 10 intervals)
- Well Completion Report number
- Groundwater basin of well (or subbasin or portion)
- Written description of well location
- Any additional comments

Groundwater Elevation Information (to be developed under Phase 3)

Phase 3 development of the CASGEM Online Submittal System will be available in late fall 2011. Phase 3 will enable Monitoring Entities to submit their groundwater elevation data and will provide public access to view the CASGEM database.

Monitoring Entities will submit the following groundwater elevation information for each well during each round of monitoring:

- Well identification number
- Measurement date
- Reference point elevation of the well (feet) using NAVD88 vertical datum
- Elevation of land surface datum at the well (feet) using NAVD88 vertical datum
- Depth to water below reference point (feet) (unless no measurement was taken)
- Method of measuring water depth
- Measurement Quality Codes
    - If no measurement is taken, a specified “no measurement” code, must be recorded. Standard codes will be provided by the online system. If a measurement is taken, a “no measurement” code is not recorded.)
    - If the quality of a measurement is uncertain, a “questionable measurement” code can be recorded. Standard codes will be provided by the online system. If no measurement is taken, a “questionable measurement” code is not recorded.)
- Measuring agency identification
- Measurement time (PST/PDT with military time/24 hour format)
- Comments about measurement, if applicable

Appendix E: Groundwater Quality Reports

PCWA UPDATE
water • energy • stewardship
PLACER COUNTY WATER AGENCY
VOL 26 NO 2 APRIL-MAY 2012

IN THIS ISSUE: ***WATER QUALITY REPORT***

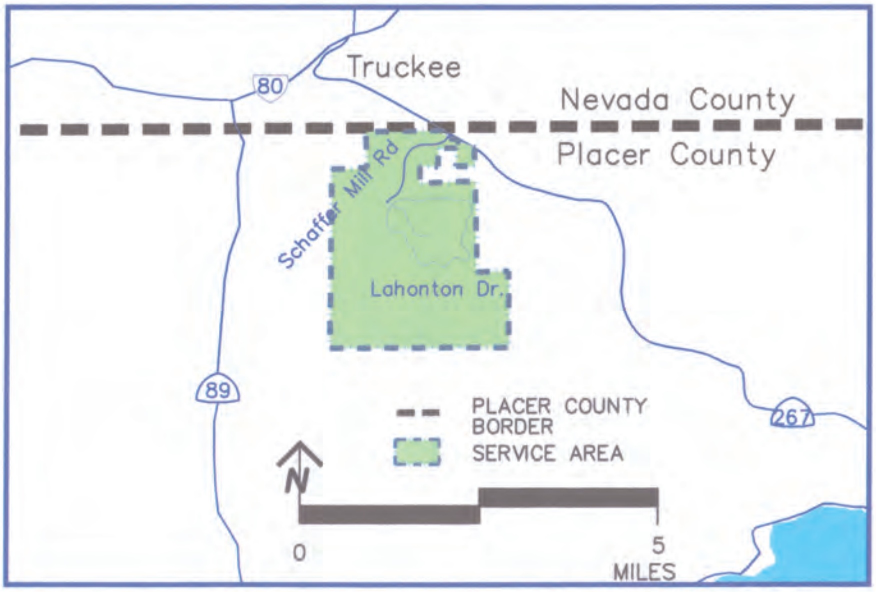
MARTIS VALLEY WATER SYSTEM for 2011 (Reported in 2012)

PCWA Water is Safe and Healthy

Placer County Water Agency is proud to supply safe and healthy water. We are pleased to report that the drinking water supplied to you meets or exceeds state and federal public health standards for drinking water quality and safety.

California water retailers, including PCWA, are required by law to inform customers about the quality of their drinking water. The results of PCWA's testing and monitoring programs of 2011 are reported in this newsletter.

If you have any questions about this report, please contact the PCWA Customer Services Center at (530) 823-4850 or (800) 464-0030.



Martis Valley Service Area

About Your Drinking Water

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the U.S. Environmental Protection Agency's **Safe Drinking Water Hotline:**

1-800-426-4791

Groundwater Supply

The Source of Your Water Supply

Water for the PCWA Martis Valley service area in eastern Placer County is pumped from the Martis Valley aquifer. Groundwater is drawn from two wells, approximately 900 feet in depth, located adjacent to Lahontan Drive and Schaffer Mill Road. Water is distributed to customers via pipeline.

Ensuring The Safety of Your Drinking Water Supply

In order to ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (USEPA) and the state Department of Public Health prescribe regulations which limit the amount of certain contaminants in water provided by public water systems. State regulations also establish limits for contaminants in bottled water that must provide the same protection for public health.

Placer County Water Agency

Consumer Confidence Report for 2011 (Reported in 2012)

MARTIS VALLEY Water System

Primary Drinking Water Standards

Constituent	No. of Samples Collected	90th Percentile Level Detected	No. of Sites exceeding AL	AL	PHG	Typical Source of Contaminant
Copper (mg/L)	5	0.14	0	1.3	0.3	Internal corrosion of household water plumbing systems; erosion of natural deposits; leaching from wood preservatives

Constituent	Units	State MCL or {MRDL}	PHG (MCLG) or {MRDLG}	Range and Average or (HRAA)	Typical Source of Contaminant
Chlorine	mg/L	{4}	{4}	0.4-1.17 (0.89)	Drinking water disinfectant added for treatment
Arsenic	ug/L	10	0.004	0-2 1	Erosion of natural deposits; runoff from orchards, glass and electronics production wastes

Secondary Drinking Water Standards

Total Dissolved Solids	mg/L	1000	None	120-130 125	Runoff, leaching from natural deposits
Specific Conductance	uS/cm	1600	None	180-190 185	Substances that form Ions when in water
Chloride	mg/L	500	None	1.3-1.8 1.55	Runoff, leaching from natural deposits
Sulfate	mg/L	500	None	0.93-1.3 1.12	Runoff, leaching from natural deposits

STATEMENT ON LEAD ***(None found in this system),*** If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. PCWA is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at *http://www.epa.gov/safewater/lead.*

DEFINITIONS: Understanding Your Water Quality Report

MCL: Maximum Contaminant Level. The highest level of a contaminant that is allowed in drinking water. Primary MCL's are set as close to the PHG's (or MCLG's) as is economically and technologically feasible. Secondary MCL's are set to protect the odor, taste and appearance of drinking water.

MCLG: Maximum Contaminant Level Goal. The level of a contaminant in drinking water below which there is no known or expected risk to health. Set by the U.S. Environmental Protection Agency.

MRDL: Maximum Residual Disinfectant Level. The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

MRDLG: Maximum Residual Disinfectant Level Goal. The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLG's do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Primary Drinking Water Standard. MCL's and MRDL's for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

PHG: Public Health Goal. The level of a contaminant in drinking water below which there is no known or expected risk to health. PHG's are set by the California Environmental Protection Agency.

AL: Action Level. The concentration of a contaminant, which if exceeded, triggers treatment or other requirements which a water system must follow.

NTU: Nephelometric Turbidity Units. A measure of the clarity of water. Turbidity is monitored because it is a good indicator of water quality. High turbidity can hinder the effectiveness of disinfectants.

TT: Treatment Technique. A required process intended to reduce the level of a contaminant in drinking water.

pCi/L: picocuries per liter. A measure of radiation.

mg/L: milligrams per liter or parts per million (ppm)

ug/L: micrograms per liter or parts per billion (ppb)

uS/cm: MicroSiemens per centimeter.

HRAA: Highest Running Annual Average

<: Less Than

ND: ND or Non-Detected: An analysis result below detectable levels.

NA: Non-Applicable

Monitoring of Unregulated Substances

Constituent	Units	State MCL (or MRDL)	PHG (MCLG) (or MRDLG)	Range (Average)	Typical Source of Contaminant
Sodium	mg/L	None	None	7.9-8.7 (8.3)	Runoff, leaching from natural deposits
Hardness	mg/L	None	None	75-80 (77.5)	Runoff, leaching from natural deposits
Radon 222	pCi/L	None	None	930-1600 (1198)	Erosion of natural deposits

Radon samples were last collected in 2001. There is no current requirement to monitor for Radon in drinking water. See below.

FOR INFORMATION on water quality or questions about this report, customers are invited to contact the Placer County Water Agency Customer Services Center at (530) 823-4850 or (800) 464-0030.

Environmental Influences on Drinking Water

The sources of drinking water (both tap and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

• Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.

• Inorganic contaminants, such as salt and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

• Pesticides and herbicides, that may come from a variety of sources such as agriculture, urban storm water runoff and residential uses.

• Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, agricultural application and septic systems.

• Radioactive contaminants, that can be naturally-occurring or be the result of oil and gas production and mining activities.

Note to At-Risk Water Users

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791.

2011 Testing Results

Measurements reported here were collected in 2011 (unless otherwise noted). In accordance with federal regulations, data is from the most recent tests. We are allowed to monitor for some contaminants less than once per year because concentrations of these contaminants do not change frequently.

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo o hable con alguien que lo entienda bien.

Martis Valley System

About Your Water Supply

Note on Radon

Radon is a radioactive gas that you can't see, smell, or taste. It is found throughout the U.S. Radon can move up through the ground and into a home through cracks and holes in the foundation. Radon can build up to high levels in all types of homes. Radon can also get into indoor air when released from tap water from showering, washing dishes, and other household activites. Compared to radon entering a home through soil, radon entering through tap water will in most cases be a small source of radon in indoor air. Radon is a known human carcinogen. Breathing air containing radon can lead to lung cancer. Drinking water containing radon may also cause increased risk of stomach cancer. If you are concerned about radon in your home, test the air. Testing is inexpensive and easy. Fix your home if the level of radon is 4 pCi/L or higher. There are simple ways to fix a radon problem that aren't too costly.

For additional information, call your State radon program (800-745-7236), the EPA Safe Drinking Water Act Hotline (800-426-4791) or the National Safe Council Radon Hotline (1-800-SOS-RADON).

PLACER COUNTY WATER AGENCY
144 Ferguson Road (P.O. Box 6570)
Auburn, California 95604

Annual Water Quality Report to PCWA Customers *(For 2011)*

Martis Valley Treated Water System

Public Meetings

The Placer County Water Agency Board of Directors meets regularly the first and third Thursdays of each month at 2 p.m. at the Placer County Water Agency Business Center, 144 Ferguson Road, in Auburn.
The public is welcome.

Contacting Your Elected Directors

DISTRICT 1: Gray Allen
DISTRICT 2: Alex Ferreira
DISTRICT 3: Lowell Jarvis
DISTRICT 4 & 2012 Board Chair: Mike Lee
DISTRICT 5 & 2012 Vice Chair: Ben Mavy

If you would like to contact a member of the board, please call the PCWA Customer Service Center at (530) 823-4850 or (800) 464-0030. We will be pleased to put you in touch with the elected representative from your area.

This newsletter is published as a public service of the

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Your Address Line 3
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TRUCKEE DONNER Public Utility District

Truckee Donner Public Utility District
11570 Donner Pass Road
Truckee, CA 96161

Truckee Donner Public Utility District

2011 Water Quality Report
Truckee Main Water System #2910003

Truckee Donner Public Utility District (TDPUD) vigilantly safeguards its mountain groundwater supplies

Last year, your tap water met all EPA and State drinking water health standards. This brochure is a snapshot of the quality of water provided to customers for the 2011 calendar year. Included in this pamphlet are details about where your water comes from, what it contains, and how it compares to State and USEPA Standards.

TDPUD is committed to providing you with the information about your water supply because customers who are well informed are the District's best allies in supporting improvements that are necessary to maintain the highest drinking water standards.

For More Information

- About this report or the water treatment process, contact Truckee Donner Public Utility District's Senior Water Quality Tech, Paul Rose at (530) 582-3926.
- About a group or class presentation, contact the Truckee Donner Public Utility District at (530) 587-3896.
- About water conservation and efficiency, the TDPUD has new water conservation programs that will help customers save water and save money. Information can be found on the TDPUD's website at www.tdpud.org or by calling (530) 582-3931.

Customer Views Are Welcome

If you are interested in participating in the decision-making process of the Truckee Donner Public Utility District, you are welcome to attend Board meetings. The Board of Directors meet at 6:00 PM on the first and third Wednesday of each month in the TDPUD Board room located at 11570 Donner Pass Road, Truckee, California. Agendas for upcoming meetings may be obtained on our website at www.tdpud.org or from the Deputy District Clerk's office, (530) 582-3909.

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo ó hable con alguien que lo entienda bien.

Where Does Our Water Come From?

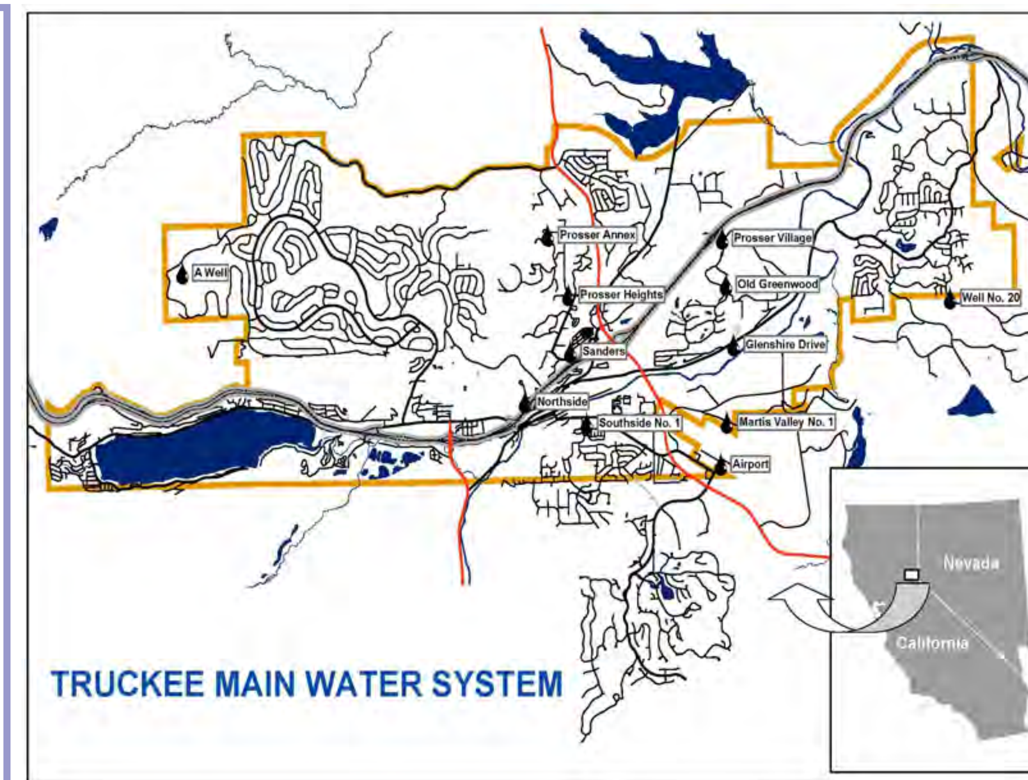
The drinking water served to Truckee Donner Public Utility District customers in the Truckee system is groundwater coming from 12 deep wells.

Each week the system is sampled for microbial quality. Because of natural filtration, the groundwater aquifer is protected from surface contamination. This gives us high quality water.

Source Water Assessment

A source water assessment was prepared in 2002 for the wells serving the Truckee area. The wells are considered most vulnerable to the following activities not associated with any detected contaminants: sewer collection systems, utility stations, railroads, and herbicide use. A copy of the complete assessment may be viewed at the Truckee Donner Public Utility District office located at 11570 Donner Pass Road, Truckee, CA or by calling Mark Thomas at (530) 582-3957.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, people who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline at 1-800-426-4791.



Radon

Radon is a radioactive gas that you cannot see, taste, or smell. It is found throughout the U.S. Radon can move up through the ground and into a home through cracks and holes in the foundation. Radon can build up to high levels in all types of homes. Radon can also get into indoor air when released from tap water from showering, washing dishes, and other household activities. Compared to radon entering the home through soil, radon entering the home through tap water will in most cases be a small source of radon in indoor air. Radon is a known human carcinogen. Breathing air containing radon can lead to lung cancer. Drinking water containing radon may also cause increased risk of stomach cancer. If you are concerned about radon in your home, test the air in your home. Testing is inexpensive and easy. You should pursue radon removal for your home if the level of radon in your air is 4 picocuries per liter of air (pCi/L) or higher. There are simple ways to fix a radon problem that are not too costly. For additional information, call your State radon program (1-800-745-7236), the EPA Safe Drinking Water Hotline (1-800-426-4791), or the National Safety Council Radon Hotline (1-800-SOS-RADON).

Lead

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Truckee Donner Public Utility District is responsible for providing high quality water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

No Cryptosporidium or Giardia in District Water

You may have seen or heard news reports about Cryptosporidium and Giardia, microscopic organisms that can enter surface waters from run-off containing animal wastes. If ingested, Cryptospridium and Giardia can cause diarrhea, fever and other gastro-intestinal symptoms. Because the Truckee Donner Public Utility District's water comes from deep wells rather than surface water, it is almost impossible to have these contaminants in the District's water supply.

DETECTED COMPOUNDS

The data presented in this table is from the most recent monitoring done in compliance with regulations. Some data is more than a year old.

Primary Contaminants (PDWS)	MCL	PHG (MCLG)	Airport Well	Northside Well	Martis Valley Well	Southside Well # 2	"A" Well	Glenshire Dr Well	Sanders Well	Prosser Annex Well	Prosser Heights Well	Well 20	Prosser Village Well	Old Greenwood Well	Violation	Major Origins in Drinking Water
Arsenic (ppb)	10	0.004	9.8	N/D	8	N/D	N/D	9.4	8.9	N/D	N/D	N/D	N/D	2.4	NO	Erosion of natural deposits
Fluoride (ppm)	2	1	N/D	0.011	N/D	N/D	N/D	N/D	N/D	0.05	N/D	N/D	0.11	N/D	NO	
Nitrate (asNO_3) (ppm)	45	45	2.9	N/D	1.9	3.7	N/D	2	N/D	N/D	N/D	1.2	2.1	N/D	NO	Leaching of natural deposits, sewage, runoff from fertilizer use.
Nitrite (ppm)	1	1	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	0.79	NO	
Radionuclides																
Radon (pCi/L)	N/A	N/A	1600	990	N/T	885	540	765	1050	740	N/D	293	560	530	N/A	Erosion of natural deposits
Regulated Contaminants with Secondary MCLs (a) (SDWS)																
Color (ACU)	15	15	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	3	N/D	5	N/D	NO	Natural-occurring organic materials
Odor	3	3	2	1	N/D	1	1	N/D	1	1	1	1	N/D	1	NO	
Iron (ppb)	300	300	N/D	N/D	6	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	NO	Leaching from natural deposits
Chloride (ppm)	500	500	5.5	17	7.1	5.7	N/D	12	53	N/D	N/D	N/D	6.4	2.2	NO	
Copper (ppm)	1	1	N/D	N/D	87	0.04	N/D	N/D	0.28	0.02	N/D	N/D	N/D	N/D	NO	
Manganese (ppb)	50	50	N/D	N/D	6.4	N/D	N/D	N/D	N/D	N/D	N/D	N/D	N/D	26	NO	
Total Dissolved Solids (ppm)	1000	1000	126	170	120	112	68	140	230	112	110	110	108	110	NO	
Sulfate (ppm)	500	500	4.1	8.9	3.5	1.3	N/D	6.7	16	N/D	N/D	N/D	1.4	1.1	NO	
Specific Conductance (µS/cm)	1600	1600	187	241	160	160	107	200	360	166	166	166	180	160	NO	Substances that form ions when in water
pH	N/A	N/A	8.1	8.3	8.1	7.1	7.4	8.3	8	8.1	8.3	8.1	8.2	8	N/A	Leaching of natural deposits
Unregulated General Minerals																
Hardness (ppm)	N/A	N/A	67	77	57	92	44	72	97	41	72	56	55	62	N/A	Leaching of natural deposits
Sodium (ppm)	N/A	N/A	10	32	9.3	4.9	3.5	12	29	15	6.4	12	16	8.5	N/A	

Microbial Contaminants	MCL	TDPUD System Highest Month		
Total Coliform Bacteria	> Than 2 positive samples or more than 5% positive samples per month	0.0 %	NO	Naturally present in the environment

Copper/Lead	AL	MCLG	TDPUD Water System 90th Percentile Value	# of Sites Sampled	# of Sites that Exceeded Action Level		
Copper (ppm)	1.3	0.3	0.074	30	0	NO	Corrosion of household plumbing systems. Flushing prior to use recommended
Lead (ppb)	15	2	2	30	0	NO	

Disinfection Residual	MRDL	MRDLG	Average	Range for TDPUD Water System		
Chlorine (ppm)	4	4	0.35	0.32 - 0.47	NO	Drinking Water Disinfectant added for treatment

Disinfection Byproducts	MCL	PHG (MCLG)	Average	Range for TDPUD Water System	Sample Date		
Total Trihalomethanes (ppb)	80	N/A	3.8	N/D - 6.2	08/04/2011	NO	By-product of drinking water disinfection

Arsenic above 5 ppb up to 10 ppb: While your drinking water meets the current Federal and State standards for arsenic, it does contain low levels of arsenic. The standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The USEPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

GENERAL INFORMATION

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- ***Microbial contaminants***, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- ***Inorganic contaminants***, such as salts and metals, that can be naturally-occurring or result from urban storm-water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- ***Pesticides and herbicides***, that may come from a variety of sources such as agricultural, urban storm-water runoff and residential uses.
- ***Organic chemical contaminants***, including synthetic and volatile organic chemicals, that are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm-water runoff, agricultural application, and septic systems.
- ***Radioactive contaminants***, that can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (USEPA) and the State Department of Public Health (Department) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that must provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline at 1-800-426-4791 or at http://water.epa.gov/drink/index.cfm.

TERMS USED IN THIS REPORT

Detected Compounds: The State allows us to monitor for some contaminants less than once per year because the concentrations of these contaminants do not change frequently. Some of our data, though representative, are more than one year old. Not listed are the hundreds of other compounds for which we tested that were not detected.
Regulated Contaminants with Secondary MCLs (a): There are no PHGs, MCLGs, or mandatory standard health effects language for these constituents because secondary MCLs are set on the basis of aesthetics.
Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste and appearance of drinking water.
Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.
Public Health Goal (PHG): The level of a contaminate in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.
Primary Drinking Water Standards (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.
Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk of health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
Secondary Drinking Water Standards (SDWS): MCLs for contaminants that affect taste, odor, or appearance of the drinking water. Contaminants with SDWSs do not affect the health a the MCL levels.
Regulatory Action Level (AL) : The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
Radiochemical Parameters—Compounds found in drinking water which emit radiation.
Microbial Parameters—Disease-causing organisms that, at certain levels, may be harmful. Additional information about Cryptosporidium and Giardia is supplied in this report.
Unregulated Compounds Analyzed—Unregulated Compounds Analyzed— Unregulated compounds that the Truckee Donner Public Utility District has tested for. These compounds are not known to be associated with adverse health effects.

N/D– not detectable at testing limit **ppm**—Parts per million, or milligrams per liter (mg/L) **ppb**—Parts per billion, or micrograms per liter (ug/L) **µS/cm—**Micro Siemens per centimeter **>** - Greater than	**pCi/L** (Picocuries per Liter) - A measure of radioactivity. **N/T**– not tested **N/A**—Not Applicable **ACU** (Apparent Color Unit) - A measure of color in drinking water.

TABLE 8 - SAMPLING RESULTS SHOWING TREATMENT OF SURFACE WATER SOURCES	
Treatment Technique [a] (Type of approved filtration technology used)	Pall membrane microfiltration with chlorination.
Turbidity Performance Standards [b] (that must be met through the water treatment process)	<u>Turbidity of the filtered water must</u>: 1 – Be less than or equal to 0.1 NTU in 95% of measurements in a month. 2 – Not exceed 1.0 NTU for more than eight consecutive hours. 3 – Not exceed 1 NTU at any time.
Lowest monthly percentage of samples that met Turbidity Performance Standard No. 1.	100%
Highest single turbidity measurement during the year	0.018
Number of violations of any surface water treatment requirements	0

(a) A required process intended to reduce the level of a contaminant in drinking water.
(b) Turbidity (measured in NTU) is a measurement of the cloudiness of water and is a good indicator of water quality and filtration performance. Turbidity results which meet performance standards are considered to be in compliance with filtration requirements.
* *Any violation of a TT is marked with an asterisk. Additional information regarding the violation is provided earlier in this report.*

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

In 2003, the NCSD conducted a source water assessment on the Big Springs source. The source is considered most vulnerable to the following activities: recreational areas, sewer collection systems, automobile repair shops, chemical/petroleum pipelines, and machine shops. These activities are not associated with any detected contaminants.

In order to ensure that tap water is safe to drink, the USEPA and the State Department of Public Health (Department) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Contaminants that may be present in source water include:

- *Microbial contaminants,* such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, pets and wildlife.
- *Inorganic contaminants*, such as salts and metals that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- *Pesticides and herbicides* that may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
- *Organic chemical contaminants,* including synthetic and volatile organic chemicals, that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems.
- *Radioactive contaminants* that can be naturally-occurring or be the result of oil and gas production and mining activities.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The NCSD is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

OUR MISSION STATEMENT: TO PROVIDE OUR SERVICES TO THE NORTHSTAR COMMUNITY IN A HIGH QUALITY, SAFE, EFFICIENT, PROFESSIONAL, AND COURTEOUS MANNER

Northstar Community Services District
908 Northstar Drive
Northstar, Calif. 96161

Northstar Community Services District Annual Water Quality Report

2011

This state-mandated annual report contains important information about the quality of your drinking water.

Dear Customer:

The Northstar Community Services District (NCSD) is proud to provide some of the nation's cleanest drinking water. In 2011, as in years past, our water met or exceeded federal and state standards for drinking water. The State of California mandates that we send this Annual Water Quality Report to you, which includes important information about your drinking water.

The NCSD draws its source water from two locations. The first source is a natural mountain spring located in the mid-mountain region of the Northstar-at-Tahoe Resort. The water is collected in the Big Springs collection system and then treated at the District's state-of-the-art Water Treatment Facility prior to being delivered to the customers' tap. The second source is a well (TH-2) located in the Martis Valley that was developed in 2007 to help meet future water demands as the community continues to expand.

We are committed to delivering the highest quality drinking water, ensuring that our customers receive clean, safe water from their taps.

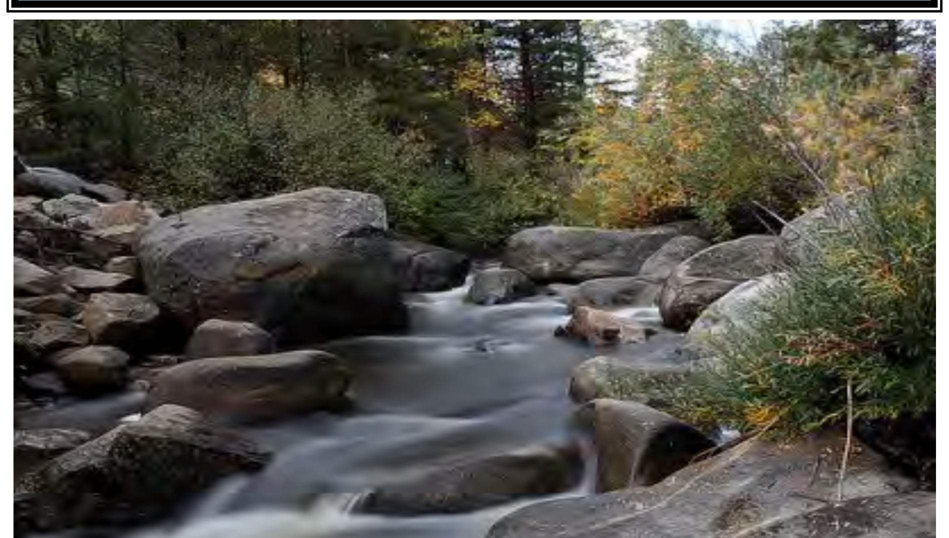
In 2011 the District delivered over 182 million gallons of drinking water through 30 miles of pipeline to over 1,800 residential and commercial services throughout the Northstar community.

Should you have any questions or would like to obtain additional information, please contact the Northstar Community Services District:

Phone: (530) 562-0747
Fax: (530) 562-1505
www.northstarcsd.com

In case of a water or sewer emergency, please call

530-562-0747



KEY WATER QUALITY TERMS

AL—Regulatory Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

MCL—Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the MCLGs as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

MCLG—Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

MRDL—Maximum Residual Disinfectant Level: The level of a disinfectant added for water treatment that may not be exceeded at the consumer's tap.

ND: Not Detectable at testing limit.

PHG—Public Health Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

ppm: parts per million or milligrams per liter (mg/L)

ppb: parts per billion or micrograms per liter (ug/L)

TT—Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.

Want More Information? The NCSD Board of Directors meets regularly each month. Please feel free to participate in these meetings. For meeting dates, times and locations please contact our main office at (530) 562-0747. You may also find more information by visiting our website: www.northstarcsd.org.

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo ó hablcon alguien que lo entienda bien.

NSCD WATER QUALITY TEST RESULTS THROUGH DECEMBER 31, 2011

TABLE 1 - SAMPLING RESULTS FOR COLIFORM BACTERIA

Microbiological Contaminant	Highest No. of detections	No. of months in violation	MCL	MCLG	Typical Source of Bacteria
Total Coliform Bacteria	(In a mo.) 0	0	More than 1 sample in a month with a detection	0	Naturally present in the environment
Fecal Coliform or *E. coli*	(In the year) 0	0	A routine sample and a repeat sample detect total coliform and either sample also detects fecal coliform or *E. coli*	0	Human and animal fecal waste

TABLE 2 - SAMPLING RESULTS FOR LEAD AND COPPER

Lead & Copper (units) Sample Dates	No. of samples collected	90th %tile level detected	No. sites exceeding AL	AL	PHG	Typical Source of Contaminant
Lead (ppb) 2009	20	4.0	0	15	2	Erosion of natural deposits; internal corrosion of household water plumbing; discharges from industrial manufacturers
Copper (ppb) 2009	20	202	0	1300	170	Erosion of natural deposits; internal corrosion of household plumbing; leaching from wood preservatives

TABLE 3 - SAMPLE RESULTS FOR SODIUM AND HARDNESS

Chemical or Constituent (units)	Source	Sample Date	Level Detected	MCL	PHG (MCLG)	Typical Source of Contaminant
Sodium (ppm)	Big Springs Well TH2	2005 2007	5.2 25.3	none	none	Generally found in ground & surface water
Hardness (ppm)	Big Springs Well TH2	2005 2007	51 90	none	none	Generally found in ground & surface water

TABLE 4 - DETECTION OF CONTAMINANTS WITH A PRIMARY DRINKING WATER STANDARD

Chemical or Constituent (units)	Source	Sample Date	Level Detected	MCL	PHG (MCLG)	Typical Source of Contaminant
Nickel (ppb)	Big Springs Well TH2	2005 2007	11 ND	100	12	Erosion of natural deposits; discharge from metal factories

TABLE 5 - DETECTION OF CONTAMINANTS WITH A SECONDARY DRINKING WATER STANDARD

Chemical or Constituent (units)	Source	Sample Date	Level Detected	MCL	PHG (MCLG)	Typical Source of Contaminant
Chloride (ppm)	Big Springs Well TH2	2005 2007	0.3 4.5	500	none	Substances that form ions when in water; seawater influence
Specific Conductance (µS/cm)	Big Springs Well TH2	2005 2007	130 262	1600	none	Substances that form ions when in water; seawater influence
Sulfate (ppm)	Big Springs Well TH2	2005 2007	ND 12.9	50	none	Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (ppm)	Big Springs Well TH2	2005 2007	101 192	1000	none	Runoff/leaching from natural deposits

TABLE 6 - DETECTION OF UNREGULATED CONTAMINANTS

Chemical or Constituent (units)	Source	Sample Date	Level Detected	Notification Level	Typical Source of Contaminant
Vanadium (ppb)	Well TH2	2007	8.0	50	Runoff/leaching from natural deposits

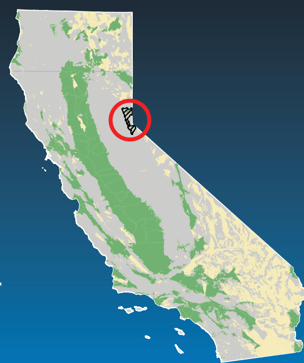
TABLE 7 - DISINFECTANTS & DISINFECTION BYPRODUCTS IN THE DISTRIBUTION SYSTEM

Chemical or Constituent (units)	Sample Date	Level Detected	MCL	MRDL	Typical Source of Contaminant
Chlorine Residual (ppm)	2011	0.81	4.0	4	Water additive used to control microbes
Total Trihalomethanes (ppb)	2011	1.2	80	N/A	By-product of drinking water chlorination
Halocetic Acids (ppb)	2011	ND	60	N/A	By-product of drinking water chlorination

Tables 1, 2, 3, 4, and 5 list all of the drinking water contaminants that were detected during the most recent sampling for the constituent. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. The Department allows us to monitor for certain contaminants less than once per year because the concentrations of these contaminants do not change frequently. Some of the data, though representative of the water quality, are more than one year old.

U.S. Geological Survey and the California State Water Resources Control Board

Groundwater Quality in the Tahoe and Martis Basins, California



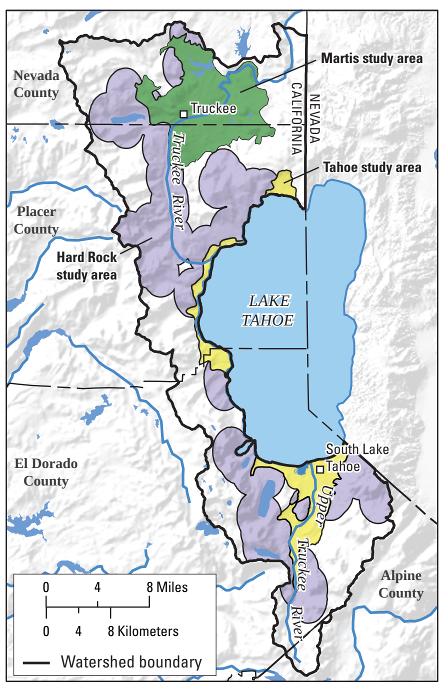
Groundwater provides more than 40 percent of California's drinking water. To protect this vital resource, the State of California created the Groundwater Ambient Monitoring and Assessment (GAMA) Program. The Priority Basin Project of the GAMA Program provides a comprehensive assessment of the State's groundwater quality and increases public access to groundwater-quality information. The Tahoe and Martis Basins and surrounding watersheds constitute one of the study units being evaluated.

The Tahoe-Martis Study Unit

The Tahoe-Martis study unit is approximately 460 square miles and includes the groundwater basins on the south, north, and west shores of Lake Tahoe, and the Martis Valley groundwater basin (California Department of Water Resources, 2003). The study unit was divided into three study areas based primarily on geography: the Tahoe study area composed of the three Tahoe Valley basins, the Martis study area, and the Hard Rock study area composed of the parts of the watersheds surrounding the basins (Fram and others, 2009).

The primary aquifers in the Tahoe study area consist of glacial outwash sediments (mixtures of sand, silt, clay, gravel, cobbles, and boulders), interbedded with lake sediments. The primary aquifers in the Martis study area are interbedded volcanic lavas, volcanic sediments, and glacial outwash sediments. In the Hard Rock study area, groundwater is present in fractured granitic rocks in the south and fractured volcanic rocks in the north. Aquifers composed of different materials commonly contain groundwater with different chemical compositions.

The primary aquifers in the study unit are defined as those parts of the aquifers corresponding to the screened or open intervals of wells listed in the California Department of Public Health database. In the Tahoe study area, these wells typically are drilled to depths between 175 and 375 feet, consist of solid casing from land surface to a depth of about 75 to 125 feet, and are screened or open below the solid casing. In the Martis study area, these wells typically are 200 to 900 feet deep, and are screened or open below 75 to 300 feet. Water quality in the shallower and deeper parts of the aquifer system may differ from that in the primary aquifers.The Hard Rock study area includes wells and developed springs.

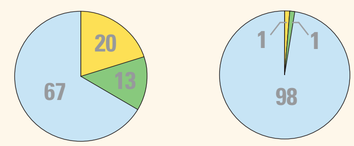


The Tahoe-Martis study unit has warm, dry summers and cold, wet winters. Average annual precipitation ranges from 30 inches at Lake Tahoe to 80 inches in the surrounding mountains, and the majority of precipitation falls as snow. Land use in the study unit is approximately 88 percent (%) undeveloped (forests, grasslands, and bare rock), and 12% urban. The undeveloped lands are used mostly for recreation. The largest urban areas are the cities of South Lake Tahoe and Truckee.

Municipal and community water supply accounts for nearly all of the total water use in the study unit, with most of the remainder used for recreation, including landscape irrigation and snow-making. Groundwater provides nearly all of the water supply in the study unit, with limited use of surface water in some areas. Recharge to the groundwater flow system is mainly from mountain-front recharge at the margins of the basins, stream-channel infiltration, and direct infiltration of precipitation. Groundwater leaves the aquifer system when it is pumped for water supply or flows into streams and lakes.

Overview of Water Quality

Inorganic constituents **Organic constituents**



CONSTITUENT CONCENTRATIONS

High **Moderate** **Low or not detected**

Values are a percentage of the area of the primary aquifers with concentrations in the three specified categories. Values on pie chart may not equal 100 due to rounding of percentages.

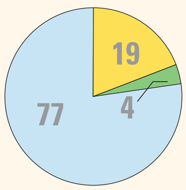
GAMA's Priority Basin Project evaluates the quality of untreated groundwater. However, for context, benchmarks established for drinking-water quality are used for comparison. Benchmarks and definitions of *high*, *moderate*, and *low* concentrations are discussed in the inset box on page 3.

Many inorganic constituents occur naturally in groundwater. The concentrations of the inorganic constituents can be affected by natural processes as well as by human activities. In the Tahoe-Martis study unit, one or more inorganic constituents were present at high concentrations in about 20% of the primary aquifers and at moderate concentrations in 13%.

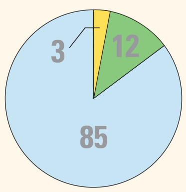
Human-made organic constituents are found in products used in the home, business, industry, and agriculture. Organic constituents can enter the environment through normal usage, spills, or improper disposal. In this study unit, one or more organic constituents were present at high concentrations in about 1% of the primary aquifers and at moderate concentrations in about 1%.

RESULTS: Groundwater Quality in the Tahoe-Martis Study Unit

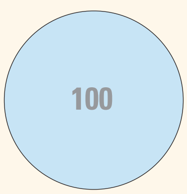
INORGANIC CONSTITUENTS



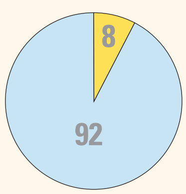
Trace elements



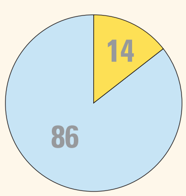
Radioactive constituents



Nutrients

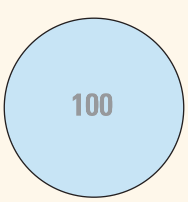


Total dissolved solids



Manganese

SPECIAL-INTEREST CONSTITUENTS



Perchlorate

Inorganic Constituents with Human-Health Benchmarks

Trace and minor elements are naturally present in the minerals in rocks and soils, and in the water that comes into contact with those materials. In the Tahoe-Martis study unit, trace elements were present at high concentrations in about 19% of the primary aquifers, and in moderate concentrations in about 4%. Arsenic was the trace element that most frequently occurred at high and moderate concentrations. Three trace elements with non-regulatory health-based benchmarks, boron, molybdenum, and strontium, also were detected at high concentrations.

Radioactivity is the emission of energy or particles during spontaneous decay of unstable atoms. Humans are exposed to small amounts of natural radioactivity every day. Most of the radioactivity in groundwater comes from decay of naturally occurring uranium and thorium in minerals in the rocks or sediments of the aquifers. Radioactive constituents occurred at high levels in about 3% of the primary aquifers, and at moderate levels in about 12%. Gross alpha particle and radon-222 activities were the radioactive constituents that most frequently occurred at high and moderate levels.

Nutrients, such as nitrogen, are naturally present at low concentrations in groundwater. High and moderate concentrations generally occur as a result of human activities. Common sources of nutrients include fertilizer applied to crops and landscaping, seepage from septic systems, and human and animal waste. In the Tahoe-Martis study unit, nutrients were not detected at high or moderate concentrations in the primary aquifers.

Inorganic Constituents with Non-Health Benchmarks

(Not included in water-quality overview charts shown on the front page)

Some constituents affect the aesthetic properties of water, such as taste, color, and odor, or may create nuisance problems, such as staining and scaling. The State of California has a recommended and an upper limit for total dissolved solids (TDS). All water naturally contains TDS as a result of the weathering and dissolution of minerals in soils and rocks. Iron and manganese are naturally occurring constituents that commonly occur together in groundwater. Anoxic conditions in groundwater (low amounts of dissolved oxygen) may result in release of manganese and iron from minerals into groundwater.

In the Tahoe-Martis study unit, TDS was present at high concentrations (greater than the upper limit) in about 8% of the primary aquifers, and at low concentrations (less than the recommended limit) in about 92% of the primary aquifers. Manganese, with or without iron, was present at high concentrations in about 14% of the primary aquifers.

Perchlorate

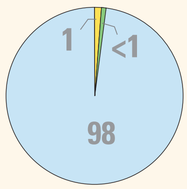
(Not included in water-quality overview charts shown on the front page)

Perchlorate is an inorganic constituent that has been regulated in California drinking water since 2007. It is an ingredient in rocket fuel, fireworks, safety flares, and other products, may be present in some fertilizers, and occurs naturally at low concentrations in groundwater. Perchlorate was not detected in the primary aquifers.

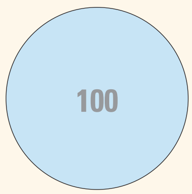
RESULTS: Groundwater Quality in the Tahoe-Martis Study Unit

ORGANIC CONSTITUENTS

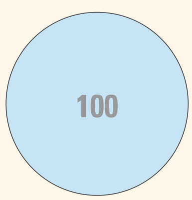
Solvents



Other volatile organic compounds



Pesticides



Organic Constituents

The Priority Basin Project uses laboratory methods that can detect the presence of low concentrations of volatile organic compounds (VOCs) and pesticides, far below human-health benchmarks. VOCs and pesticides detected at these low concentrations can be used to help trace water from the landscape into the aquifer system.

Volatile Organic Compounds with Human-Health Benchmarks

VOCs are in many household, commercial, industrial, and agricultural products, and are characterized by their tendency to volatilize (evaporate) into the air.

Solvents are used for a number of purposes, including manufacturing and cleaning. In the Tahoe-Martis study unit, solvents were present at high concentrations in about 1% of the primary aquifers. The solvent detected at high concentrations was tetrachloroethylene (PCE), which mainly was used in dry-cleaning businesses. Solvents were present at moderate concentrations in about 1% of the primary aquifers, and at low concentrations (or not detected) in about 98%.

Other VOCs include trihalomethanes, gasoline additives and oxygenates, refrigerants, and organic synthesis reagents. Trihalomethanes form during disinfection of water supplies, and may enter groundwater by the infiltration of landscape irrigation water, or leakage from distribution lines. Gasoline additives and oxygenates increase the efficiency of fuel combustion. Other VOCs were not detected at high or moderate concentrations in the primary aquifers. Trihalomethanes and gasoline oxygenates were detected at low concentrations in the primary aquifers.

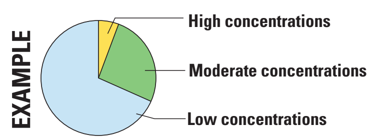
Pesticides with Human-Health Benchmarks

Pesticides, including herbicides, insecticides, fungicides, and fumigants, are applied to crops, gardens, lawns, around buildings, and along roads to help control unwanted vegetation (weeds), insects, fungi, and other pests. In the Tahoe-Martis study unit, pesticides were not detected at high or moderate concentrations in the primary aquifers. Herbicides were occasionally detected at low concentrations.

BENCHMARKS FOR EVALUATING GROUNDWATER QUALITY

GAMA's Priority Basin Project uses benchmarks established for drinking water to provide context for evaluating the quality of untreated groundwater. After withdrawal, groundwater may be disinfected, filtered, mixed, and exposed to the atmosphere before being delivered to consumers. Federal and California regulatory benchmarks for protecting human health (Maximum Contaminant Level, MCL) were used when available. Nonregulatory benchmarks for protecting aesthetic properties, such as taste and odor (Secondary Maximum Contaminant Level, SMCL), and nonregulatory benchmarks for protecting human health (Notification Level, NL, and Lifetime Health Advisory, HAL) were used when Federal or California regulatory benchmarks were not available.

CONSTITUENT CONCENTRATIONS



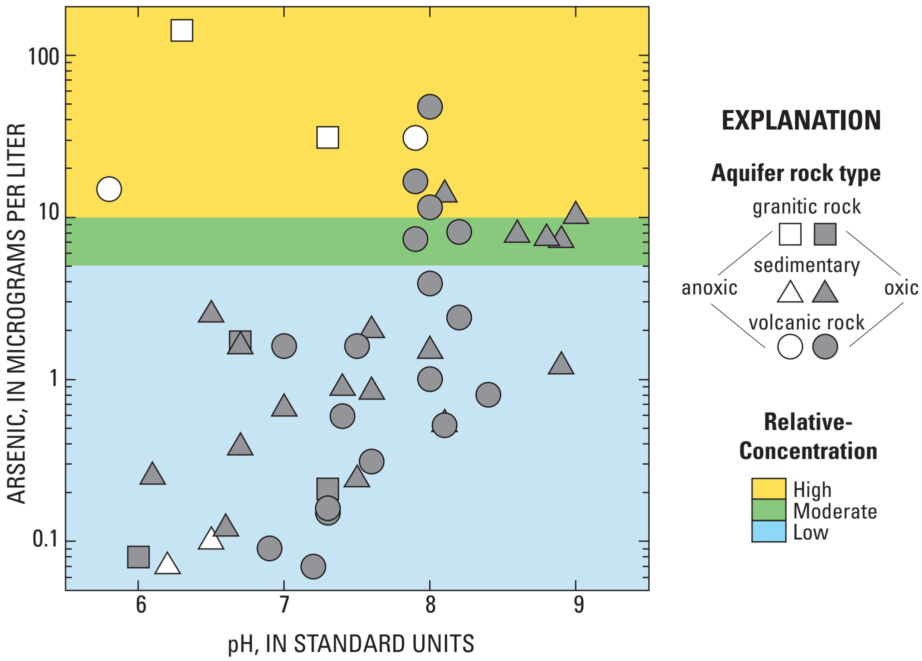
Values are a percentage of the area of the primary aquifers with concentrations in the three specified categories. Values on pie chart may not equal 100 due to rounding of percentages.

High, moderate, and low concentrations are defined relative to benchmarks

Concentrations are considered *high* if they are greater than a benchmark. For inorganic constituents, concentrations are *moderate* if they are greater than one-half of a benchmark. For organic constituents and perchlorate, concentrations are *moderate* if they are greater than one-tenth of a benchmark; this lower threshold was used because organic constituents are generally less prevalent and have smaller concentrations relative to benchmarks than inorganic constituents. *Low* values include nondetections and values less than moderate concentrations. Methods for evaluating water quality are discussed in Fram and Belitz (2012).

Factors that Affect Groundwater Quality

In the Tahoe-Martis study unit, arsenic was the constituent that most frequently occurred at high concentrations. About 18% of the primary aquifers had arsenic concentrations greater than the human-health regulatory benchmark Federal MCL) of 10 µg/L (micrograms per liter). Natural sources of arsenic to groundwater include dissolution of arsenic-bearing sulfide minerals, desorption of arsenic from the surfaces of manganese- or iron-oxide minerals (or dissolution of those oxide minerals), and mixing with geothermal waters (Welch and others, 2000).



In the Tahoe-Martis study unit, elevated arsenic concentrations likely are caused by two different processes (Fram and Belitz, 2012). In aquifers composed of sediments or volcanic rocks, high and moderate arsenic concentrations were found in groundwater that was oxic (high dissolved oxygen concentration) and alkaline (pH values greater than about 8). The elevated arsenic concentration in oxic, alkaline groundwater likely is due to desorption of arsenic from the surfaces of manganese- and iron-oxide minerals (Smedley and Kinniburgh, 2002). Oxic, alkaline conditions increase arsenic solubility in groundwater by inhibiting arsenic from adhering to mineral surfaces (sorption). In aquifers composed of granitic and volcanic rocks, high arsenic concentrations also were found in anoxic (low dissolved oxygen concentration) groundwater with low pH values. Dissolution of manganese- and iron-oxide minerals under anoxic conditions likely results in release of arsenic associated with these minerals.

By Miranda S. Fram and Kenneth Belitz

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Priority Basin Assessments

GAMA's Priority Basin Project (PBP) assesses water quality in that part of the aquifer system used for drinking water, primarily public supply. Water quality in the primary aquifers, assessed by the PBP, may differ from that in the deeper parts of the aquifer, or from the shallower parts, which are being assessed by GAMA's Domestic Well Project. Ongoing assessments are being conducted in more than 120 basins throughout California.

The PBP assessments are based on a comparison of constituent concentrations in untreated groundwater with benchmarks established for protection of human health and for aesthetic concerns. The PBP does not evaluate the quality of drinking water delivered to consumers.

The PBP uses two scientific approaches for assessing groundwater quality. The first approach uses a network of wells to statistically assess the status of groundwater quality. The second approach combines water-quality, hydrologic, geographic, and other data to help assess the factors that affect water quality. In the Tahoe-Martis study unit, data were collected by the PBP in 2007, and from the CDPH database for 2004–2007. The PBP includes chemical analyses generally not available as part of regulatory compliance monitoring, including measurements at concentrations much lower than human-health benchmarks, and measurement of constituents that can be used to trace the sources and movement of groundwater.

For more information

Technical reports and hydrologic data collected for the GAMA PBP Program may be obtained from:

GAMA Project Chief
U.S. Geological Survey
California Water Science Center
4165 Spruance Road, Suite 200
San Diego, CA 92101
Telephone number: (619) 225-6100
[WEB: http://ca.water.usgs.gov/gama](http://ca.water.usgs.gov/gama)

GAMA Program Unit
State Water Resources Control Board
Division of Water Quality
PO Box 2231, Sacramento, CA 95812
Telephone number: (916) 341-5779
[WEB: http://www.waterboards.ca.gov/gama](http://www.waterboards.ca.gov/gama)

Appendix F: DRI Technical Note

Technical Note

To: **Tony Firenzi, Placer County Water Agency; Tina Bauer, Brown and Caldwell**

From: **Seshadri Rajagopal, Donald M. Reeves, Justin Huntington, Greg Pohll (Desert Research Institute)**

Date: **September 10, 2012**

Re: **Estimates of Ground Water Recharge in the Martis Valley Ground Water Basin**

Purpose and Scope

This technical note provides spatially-distributed estimates of annual ground water recharge in the Martis Valley Ground Water Basin using a physically-based hydrologic model: Precipitation Runoff Modeling System (PRMS). PRMS simulates land surface hydrologic processes of evapotranspiration, runoff, infiltration, and interflow by balancing energy and mass budgets of the plant canopy, snowpack, and soil zone on the basis of distributed climate information (Leavesley et al., 1983), and has been used in several other basins to estimate ground water recharge (e.g., Lichty and McKinley, 1995; Vaccaro and Olsen, 2007; Cherkauer and Ansari, 2005; Cherkauer, 2004). Recharge in the current study is defined as the infiltration of water to the subsurface beyond the root zone (where present) or the soil zone, in case of bare soil absent of vegetation (Figure 1). Thus, the recharge estimates contained within this report represent total annual recharge within the delineated Martis Valley Ground Water Basin. The Martis Valley Ground Water Basin was first delineated by Hydro-Search, Inc. and was later adopted by the California DWR as the official ground water basin. In this report we refer to this region as the HSI ground water basin or Martis Valley Ground Water Basin (Figure 2). Total recharge consists of both recharge to the deep ground water system and shallow recharge that ultimately discharges into streams. The technical note describes the use of climate data in PRMS, the PRMS method used to compute recharge, and recharge estimates. Recharge estimates from previous studies and an additional method are provided to place the PRMS computed results in the context of other estimates.

Previous Estimates of Recharge for Martis Valley

Past studies primarily relied on empirical and water balance methods to estimate recharge within the Martis Valley Ground Water Basin (Figure 2). One of the earliest recharge studies was conducted by Hydro-Search, Inc. (1974) which was subsequently updated in 1980 and 1995. Hydro-Search Inc. (HSI) utilized a water balance method to estimate ground water recharge to the Martis Valley Ground Water Basin of approximately 18,000 ac-ft/yr. In 2001 Nimbus Engineers used a water balance approach to compute a recharge value of 24,700 ac-ft/yr to the ground water basin. Kennedy/Jenks Consultants in 2001 published a report titled "Independent Appraisal of Martis Valley Ground Water Availability, Nevada and Placer Counties, California" where they concluded that the earlier studies by Hydro-Search, Inc (1974 and updates) and Nimbus Engineers (2001) were conservative, as the total amount of ground water discharge to streams was considered under predicted; however, updated recharge estimates were not provided in this report. Interflow Hydrology, Inc. and Cordilleran Hydrology, Inc. prepared a 2003 report indicating that ground water discharge to tributary Truckee River streams in the Martis Valley Ground Water Basin is 34,560 ac-ft/yr, of which approximately 24,240 ac-ft/yr is contributed by high altitude areas of the basin (e.g., in the vicinity of Northstar) and the remaining 10,320 ac-ft/yr occurs in lower elevation areas. In summary, previous recharge estimates based on water balance approaches range from 18,000 to 34,560 ac-ft/yr.

Description of PRMS Recharge Method

The PRMS model (Leavesley et al., 1983) is driven by daily values of precipitation and maximum and minimum air temperature, and simulates snow accumulation, ablation, canopy interception, evapotranspiration, surface runoff, infiltration, water storage in the soil zone and deep percolation through the bottom of the root or soil zone – PRMS recharge is defined as the model computed excess water leaving the root or soil zone after abstractions for surface runoff and evapotranspiration are accounted for (Figure 1). The system is modeled in its natural transient state from 1981 to 2011. Reservoir operations, irrigation within the basin, septic drainfields, and diversion of effluent to the Truckee Tahoe Sanitation Agency and subsequent release of treated effluent to the Truckee River are not explicitly simulated in the model. However, the Martis Valley PRMS model utilizes naturalized flows that remove the effects of reservoir operations during model calibration.

The current PRMS model developed for Martis Valley encompasses the entire Martis Valley hydrologic basin (Figure 2), and is subdivided into 14 watersheds for model calibration to internal stream gauges. Computation of recharge for the Martis Valley Ground Water Basin requires aggregation of the PRMS results for all cells within the delineated ground water basin (Figure 3). The model domain was discretized into square grid cells of 300 m resolution; each of these cells represents a hydrologic response unit (HRU). The model is parameterized from the National Elevation Dataset (NED), STATSGO soils database, and USGS land use land cover (LULC) dataset. The depth of the root or soil zone is determined by the LULC of the HRU. Five categories of LULC are used to assign these depths viz. bare soils, grasses, shrubs, trees, and water. For the category water, recharge is assumed zero.

Daily weather data from the Truckee #2 SNOTEL site is used to drive the PRMS model. This station is used to develop monthly ratios based on PRISM maps to distribute precipitation over the entire basin. To account for days when temperature inversions within the valley occur, an additional weather station, Mt. Rose SNOTEL, is implemented.

PRMS Recharge Estimates

The estimated mean annual ground water recharge for the Martis Valley Ground Water Basin computed from PRMS is presented in Figure 4. PRMS simulated recharge varies from year to year based on annual cycles of precipitation (Figure 5). The annual average recharge estimate from the PRMS model is 32,745 ac-ft, which is slightly lower than the Interflow Hydrology 2003 estimate of 34,560 ac-ft.

We also applied a modified Maxey-Eakin (1949) method to estimate recharge which relates mean annual precipitation to recharge using recharge coefficients applied to precipitation amounts (Figure 3) (Epstein et al., 2010). Epstein et al., 2010 computed revised Maxey-Eakin coefficients that are based on the PRISM precipitation distribution (Daly et al., 1994), which was used in this study. As shown in Figure 3, the modified Maxey-Eakin estimate of 35,168 ac-ft/yr is very close to the Interflow Hydrology estimate. Figure 6 shows the ratio of recharge computed by the PRMS model to annual precipitation. This ratio, which we term as 'recharge efficiency', can be used to describe the fraction (or percentage) of precipitation that is converted to recharge. Computed recharge efficiencies for the Martis Valley ground water basin varies annually within a range of 18-26%.

Discussion of Recharge Estimates

PRMS computed recharge presented in Figures 4, 6 and 8 show that recharge to the Martis Valley Ground Water Basin varies both spatially and temporally. The spatial variability in recharge is primarily driven by precipitation trends (Figures 7 and 8). This is clearly observed in Figure 7 where the higher elevation areas, in general, receive greater amounts of precipitation than the rest of the basin. Note that the PRMS recharge shown in Figure 8 represents infiltrated water given the processes presented in Figure 1. The PRMS model neglects the influence of low permeable bedrock areas on the potential reduced rate of infiltration of precipitation. For example, the highest infiltration rates correspond to areas with the most precipitation. In reality, the highest elevation areas within the basin that receive the greatest amount of precipitation are located in the low-permeability mountain block. The low-permeability of the mountain block restricts the amount of infiltrating water, and forces water to redistribute as run-off and infiltrate downslope near the 'bench' areas of the slope with deposits of higher permeability alluvium. This redistribution has been simulated in integrated models (e.g., Huntington et al. 2012, in press) and inferred from ground water isotopes (Singleton et al., 2010). Thus, the spatial distribution of recharge, as shown in Figure 8, will change once the PRMS modeled recharge is combined with MODFLOW. This spatial redistribution will primarily change the pattern of recharge in the mountain block watersheds with only minimal changes to the lower elevation areas, and minimal changes in the total volume of recharge.

Previous recharge estimates by Interflow Hydrology (34,560 ac-ft/yr), the Maxey-Eakin method (35,168 ac-ft/yr), and mean annual PRMS (32,745 ac-ft/yr) estimates are very similar and in agreement. Only the PRMS estimates provide insight as to annual variability in recharge with a range between 12,143 and 56,792 ac-ft/yr (Figure 4). These fluctuations in annual ground water recharge estimates are natural and primarily based on fluctuations in annual precipitation (Figure 5). Perhaps most importantly are the water years when the amount of recharge is lower than the mean (~33,000 ac-ft). As shown in Figure 4, this variability can be significant with 'wet' and 'dry' year-end members. Pumpage during dry years may deplete the ground water basin as water is extracted from storage, whereas wet years increase the storage of water in the basin. If the number of wet and dry years and the amount of recharge oscillates evenly, then the mean recharge estimates from Interflow, modified Maxey-Eakin and PRMS methods are suitable for mean annual water budget analysis. However, future changes in temperature and/or precipitation (both timing and annual quantity) can disrupt the balance between pumping and basin storage.

The PRMS computed recharge consists of the sum of shallow infiltrated water that discharges into the Truckee River and its tributaries as well as deep percolation of ground water to deeper aquifers with water supply wells. Perennial basin yield, defined by the State of Nevada as the maximum amount of groundwater that can be salvaged each year over the long term without depleting the ground water reservoir, is not an appropriate metric to determine sustainable basin pumpage as values of perennial yield for a basin are usually limited to the maximum amount of natural discharge. Natural discharge from Martis Valley Basin consists of groundwater evapotranspiration, groundwater discharge to the Truckee River, along with a small quantity of groundwater outflow. As an alternative, we suggest that an analysis that utilizes the Martis Valley ground water model to define the 'capturable' amount of streamflow by pumping within the basin (e.g., Leake and Haney, 2010) would better quantify the relationship between sustainable pumpage and natural discharge.

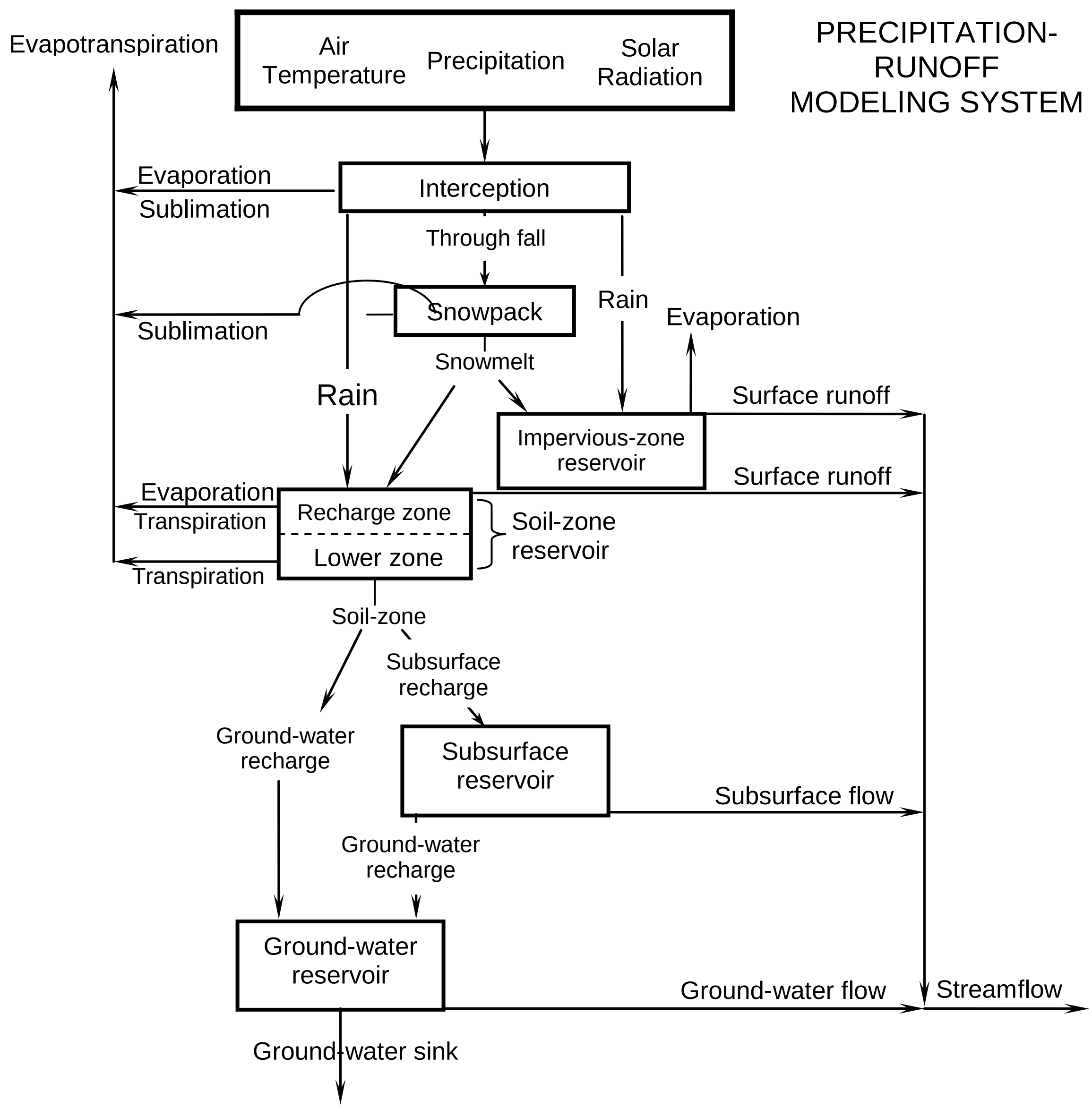

Figure 1. PRMS conceptual model schematic highlighting all simulated hydrologic processes and how ground water recharge is computed in the model (based on Leavesley et al., 1983).

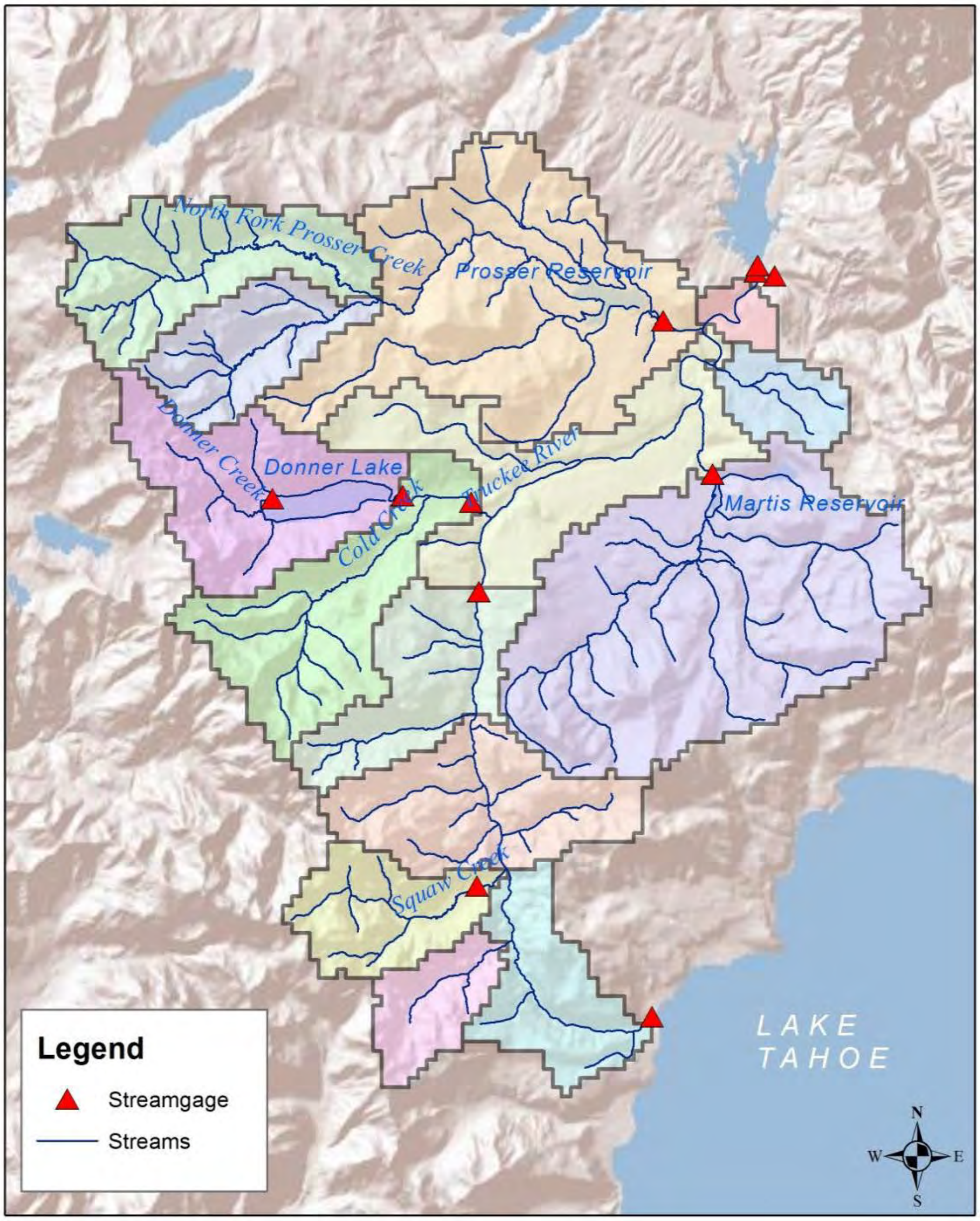

Figure 2. PRMS model domain with 14 sub-watersheds denoted by color. Stream gauges used in the PRMS calibration are denoted by triangles.

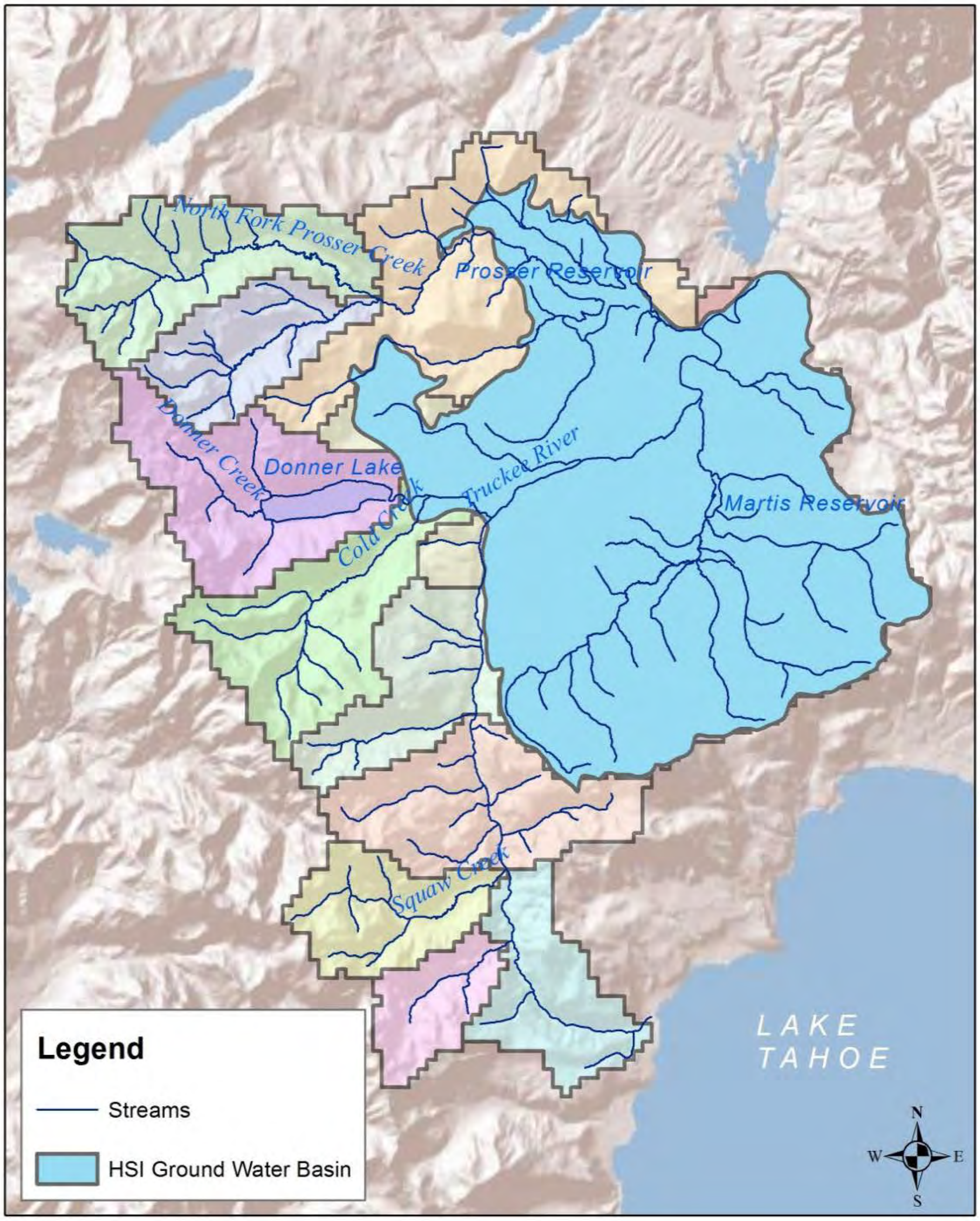

Figure 3. PRMS model domain with a portion of the sub-watersheds combined to adhere to the delineated Martis Valley Ground Water Basin inset (blue). All recharge estimates in this study are computed over the blue area. The Martis Valley Ground Water Basin area was delineated by Hydro Search Inc. (HSI).

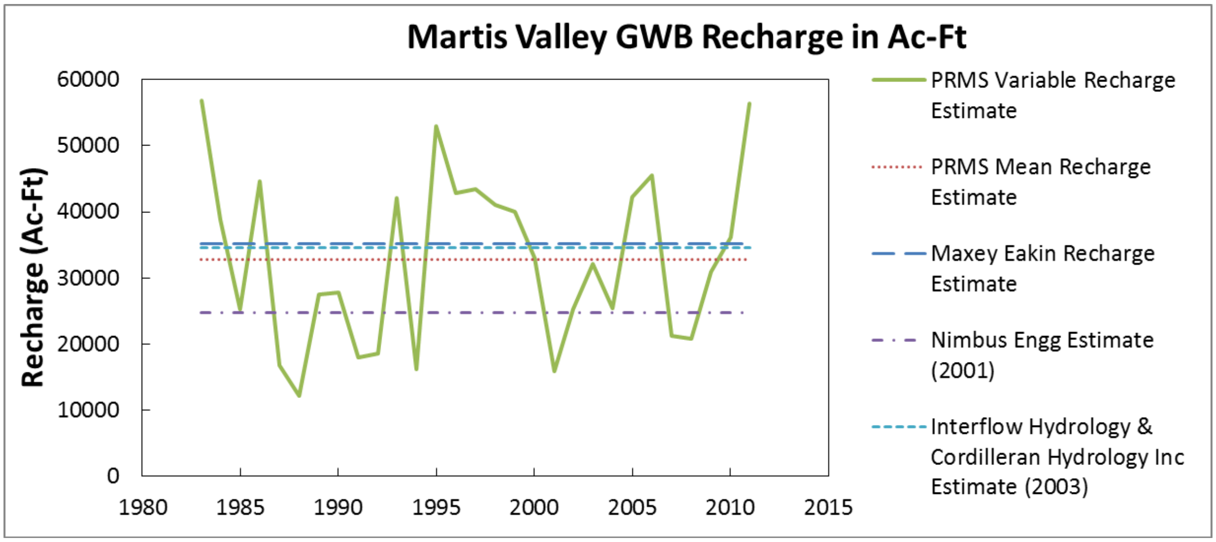

Figure 4. Annual recharge volumes computed by PRMS with comparison to recharge estimates from other methods and past studies.

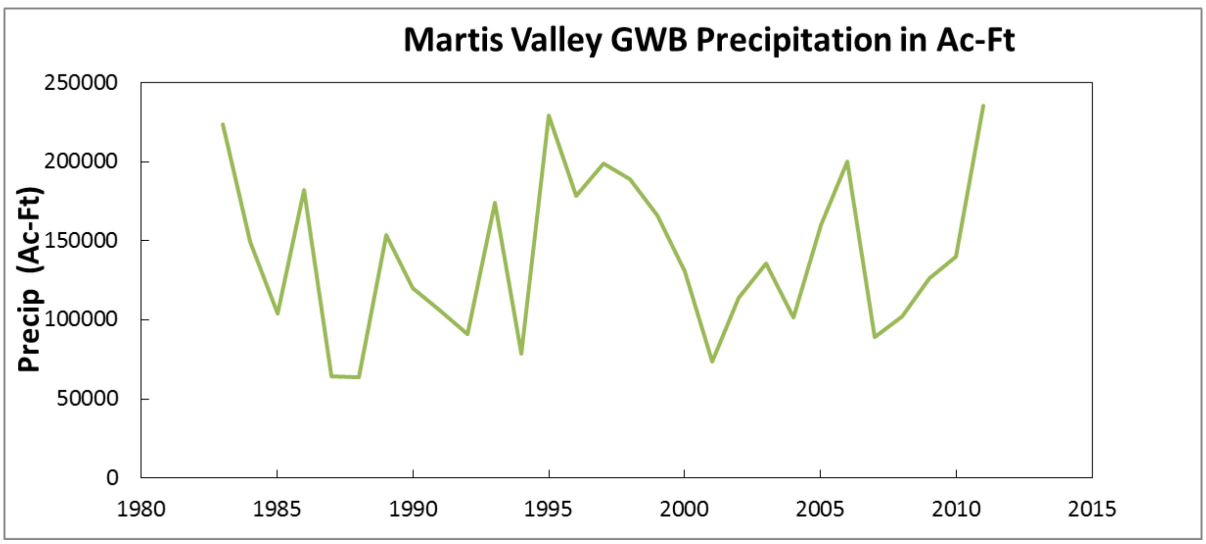

Figure 5. Annual precipitation volume over the Martis Valley Ground Water Basin

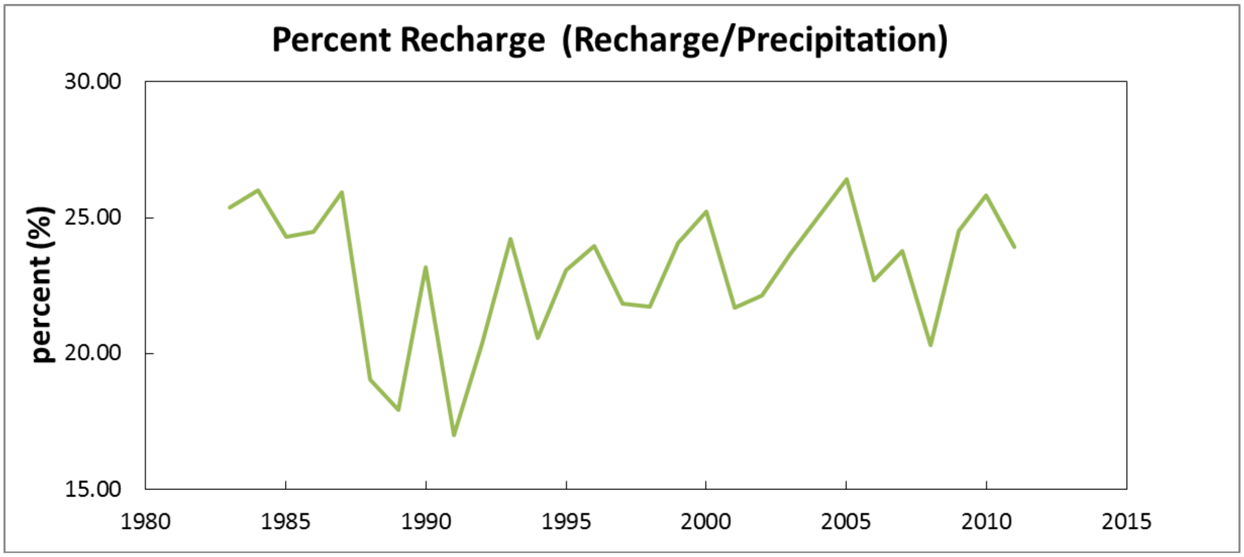

Figure 6. Value of recharge efficiency computed as the ratio of annual recharge to annual precipitation. The mean recharge efficiency value is 23%.

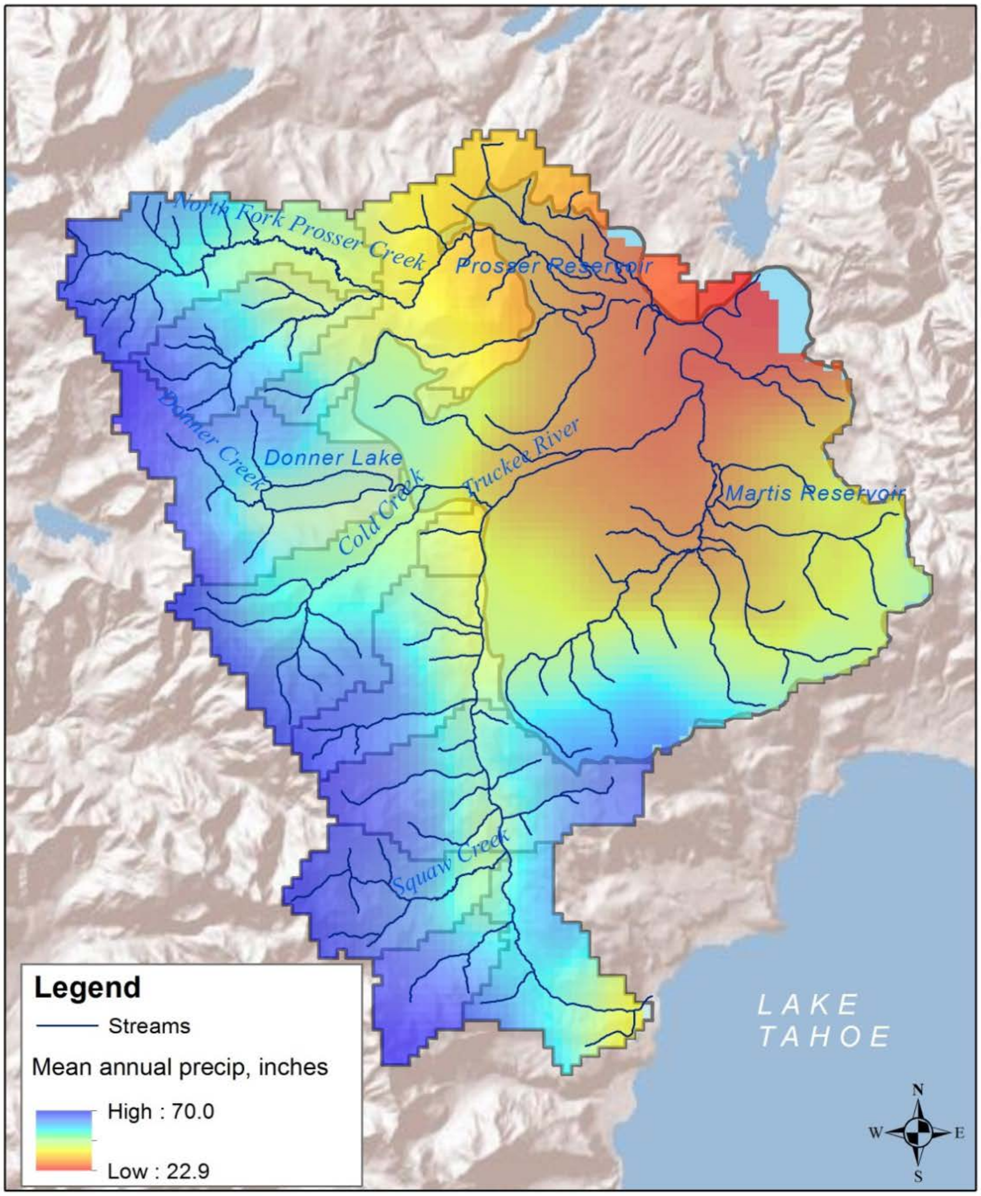

Figure 7. Mean annual precipitation (inches) in the Martis Valley PRMS model domain from PRISM (Daly et al., 1994).

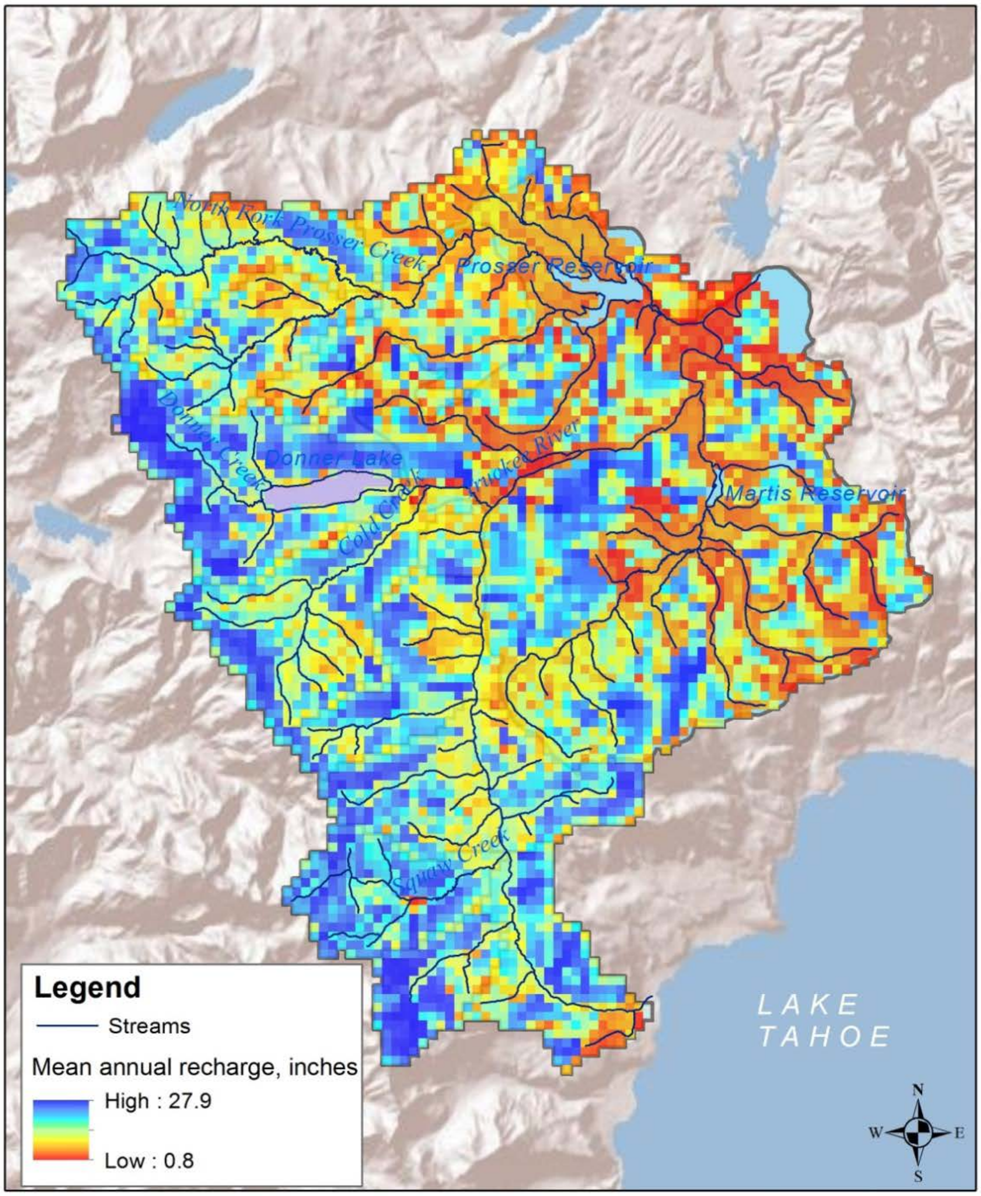

Figure 8. Mean annual recharge (inches) in the Martis Valley PRMS model domain. Note that the greatest quantities of recharge occurs in the high elevation areas which receive more precipitation (Figure 7).

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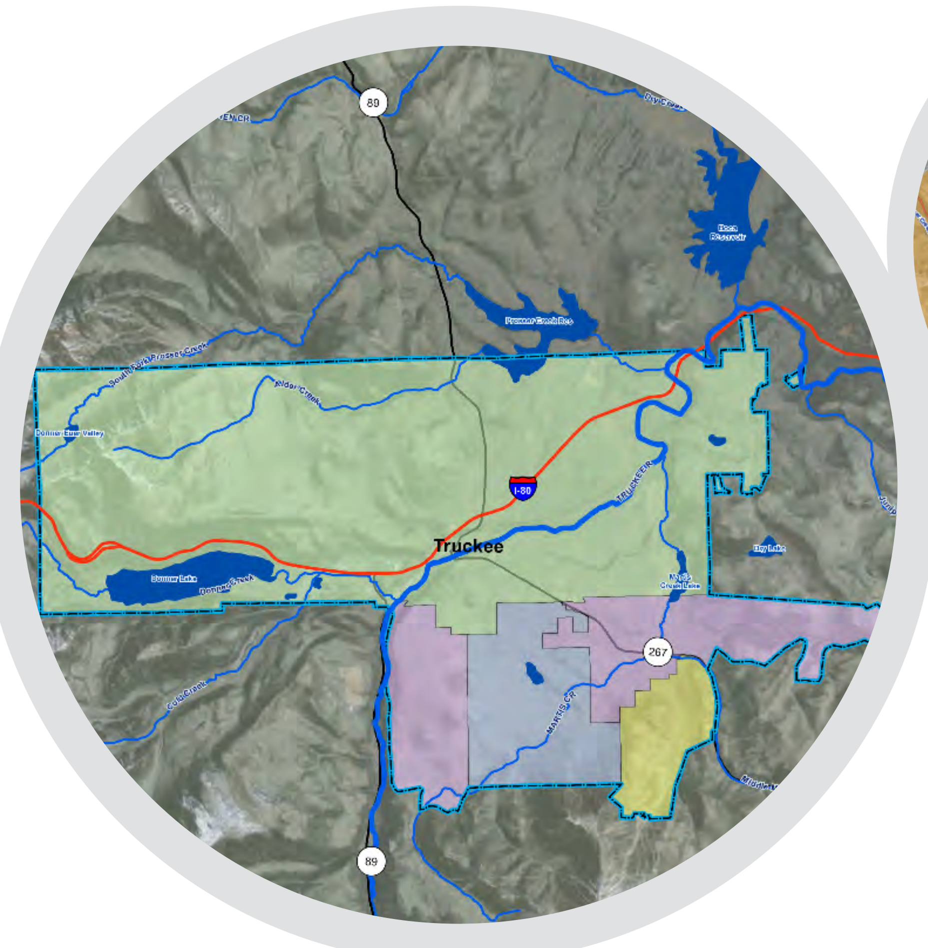

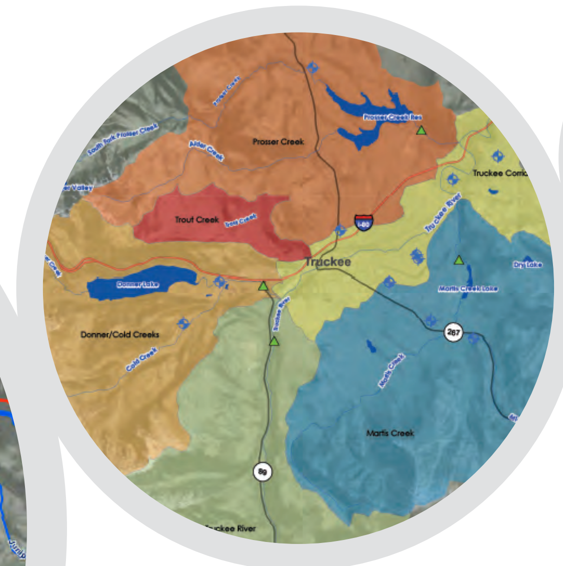

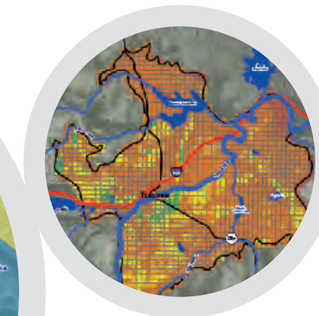

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APPENDIX D

ORDINANCE NO. 2014-05, FINDING THE NECESSITY FOR AND ADOPTING A WATER CONSERVATION PROGRAM IN THE EVENT OF A WATER SUPPLY EMERGENCY

TRUCKEE DONNER
Public Utility District

Ordinance No. 2014 - 05

FINDING THE NECESSITY FOR AND ADOPTING A WATER CONSERVATION PROGRAM IN THE EVENT OF A WATER SUPPLY OR DROUGHT EMERGENCY

WHEREAS, California Water Code Sections 375 et. seq. permit public entities which supply water at retail to adopt and enforce a water conservation program to reduce the quantity of water used by the people therein for the purpose of conserving the water supplies of such public entity;

WHEREAS, California Water Code Section 10632 requires an urban water supplier to describe stages of action to be undertaken in the event of a water supply shortage;

WHEREAS, the Board of Directors of Directors of the Truckee Donner Public Utility District has determined that it is necessary to establish a water conservation program in the event of any future water supply shortage or drought emergency;

WHEREAS, the Board of Directors finds and determines that a water shortage could exist in the event of major failure of one or more components of the water system or drought;

WHEREAS, the Board of Directors also finds and determines that the water sources available be put to maximum beneficial use to the extent to which they are capable, and that the waste or unreasonable use, or unreasonable method of use, of water be prevented and that the conservation of such water be encouraged with a view to the maximum reasonable and beneficial use thereof in the interest of the people of the District and for the public welfare.

NOW THEREFORE BE IT ENACTED by the Board of Directors of the Truckee Donner Public Utility District as follows:

1. The General Manager is hereby authorized and directed to implement the provisions of this ordinance. Additionally, the General Manager is hereby charged with interpretation, regulation and enforcement of the provisions of this ordinance, and authorized to make exceptions to prevent undue hardship or unreasonable restrictions, provided that water shall not be wasted or used unreasonably and the purpose of this ordinance can be accomplished.

2. To the extent that any of the existing and prior ordinances of the District applicable to its water system are inconsistent herewith, all such prior water ordinances shall be deemed revoked upon this ordinance becoming effective to the extent that they are inconsistent.

3. The provisions of this ordinance shall apply to all water served to persons, customers, and property by the District. The District shall declare which portions of the service area are subject to a water supply emergency and the requirements of this ordinance.

4. The provisions of this ordinance are not applicable to the uses of water which are necessary to protect public health and safety or for essential governmental services, such as police, fire and other similar emergency services.

5. **Water Conservation Stages**: No person shall knowingly use water or permit the use of water supplied by the District for commercial, industrial, agricultural, governmental, or any other purpose in a manner contrary to any provision of this ordinance, in an amount in excess of the amounts authorized by this ordinance or during any period of time other than the periods of time specified in this ordinance. At no time shall water be wasted or used unreasonably.

6. The following stages shall take effect upon declaration as herein provided:

   (a) Stage 1 – Targeted 10% Reduction in Water Usage - Voluntary Compliance: Stage 1 applies during periods that the District determines that water usage should be reduced approximately 10% in order to meet all of the water demands of its customers. Specific mandated restrictions in water use for Stage 1 are as follows:

   1. Irrigation with potable water of ornamental landscapes and turf shall be limited to every other day.
   2. The application of potable water to driveways and sidewalks shall be prohibited unless for driveway sealing or construction.
   3. The use of a hose that dispenses potable water to wash a motor vehicle, except where the hose is fitted with a shut-off nozzle, shall be prohibited

   (b) Stage 2 – Targeted 20% Reduction in Water Usage - Mandatory Compliance: Stage 2 applies during periods that the District determines that water usage should be reduced approximately 20% in order to meet all of the water demands of its customers. Specific mandated restrictions in water use for Stage 2 are as follows:

   1. Irrigation with potable water of ornamental landscapes and turf shall be limited to every other day.
   2. The application of potable water to driveways and sidewalks shall be prohibited unless for driveway sealing or construction.
   3. The use of a hose that dispenses potable water to wash a motor vehicle, except where the hose is fitted with a shut-off nozzle, shall be prohibited.
   4. Customers may be subject to fines and penalties for failure to comply with this requirement.

   (c) Stage 3 – Targeted 30% Reduction in Water Usage - Mandatory Compliance: Stage 3 applies during periods that the District determines that water usage should be reduced approximately 30% in order to meet all of the water demands of its customers. Specific mandated restrictions in water use for Stage 3 are as follows:

   1. Irrigation of ornamental landscapes and turf shall be limited to 3-days per week.
   2. The application of potable water to driveways and sidewalks shall be prohibited.
   3. The use of a hose that dispenses potable water to wash a motor vehicle, except where the hose is fitted with a shut-off nozzle, shall be prohibited.
   4. Customers may be subject to fines and penalties for failure to comply with this requirement.
   5. The District may install flow restricting devices on a customer's service.

(d) Stage 4 – Targeted 40% Reduction in Water Usage - Mandatory Compliance: Stage 4 applies during periods that the District determines that water usage should be reduced approximately 40% in order to meet all of the water demands of its customers. Specific mandated restrictions in water use for Stage 4 are as follows:

1. Irrigation of ornamental landscapes and turf shall be limited to 2-days per week.
2. The application of potable water to driveways and sidewalks shall be prohibited.
3. The use of potable water to wash a motor vehicle, except where the hose is fitted with a shut-off nozzle, shall be prohibited.
4. Any customer leak in plumbing and / or irrigation systems shall be repaired when found, but in any case within ten (10) days of notice by the District to repair. The District may perform the repair or hire a contractor to perform the repair, and then invoice the customer for those costs.
5. The District may install flow restricting devices on a customer's service.
6. Customers may be subject to fines and penalties for failure to comply with this requirement.

(e) Stage 5 – Targeted 50% Reduction in Water Usage - Mandatory Compliance: Stage 5 applies during periods that the District determines that water usage should be reduced approximately 50% in order to meet all of the water demands of its customers. Specific additional mandated restrictions in water use for Stage 5 are as follows:

1. All outdoor water uses are prohibited in the area affected by the water conservation requirement. The District may discontinue service to irrigation services.
2. Any customer leak in plumbing system shall be repaired when found, but in any case within ten (10) days of notice by the District to repair. The District may perform the repair or hire a contractor to perform the repair, and then invoice the customer for those costs.
3. The District may install flow restricting devices on a customer's service.
4. The District may implement mandatory water rationing through the use of rolling outages.
5. Customers may be subject to fines and penalties for failure to comply with this requirement.

7. **Implementation of Conservation Stages**. The District shall monitor the projected supply and demand for water by its customers on a daily basis. In the event of an emergency, the General Manager shall determine the extent of the conservation required through the implementation and/or termination of particular conservation stages in order for the District to prudently plan for and supply water to its customers. Thereafter, the General Manager may order that the appropriate stage of water conservation be implemented or terminated in accordance with the applicable provision of this ordinance. Water system customers shall be notified of water conservation stages by one or more of the following methods:

(a) Door hanger notices delivered to the property served

(b) Mass mailing to customers and property owners

(c) Announcements in local media such as newspapers, radio and television

(d) Any other methods deemed appropriate by the General Manager

The stage designated shall become effective immediately upon announcement. The declaration of any stage shall be reported to the Board of Directors as soon as practicable and convene a special meeting as soon as possible. The Board of Directors shall thereupon ratify the declaration, rescind the declaration, or direct the declaration of a different stage.

8. VIOLATIONS

In order to protect the health, safety and welfare of the community, the District shall serve any customer found to be violating any provision of this ordinance with written notice, in accordance with Section 11, stating the nature of the violation and providing a reasonable time limit for the satisfactory correction. If a violation is not corrected within the time limit prescribed, the General Manager may exercise his authority to disconnect the water service from the District's system based upon the severity of the violation. Disconnect and reconnect fees shall be assessed per the District's fee schedule.

9. REQUESTS FOR EXEMPTION OR DEVIATION

All requests for exemption or deviation from these standards shall be submitted, in writing, by the customer to the General Manager. The customer must obtain written permission and not assume that permission will be forthcoming for exemptions or deviations.

The General Manager may temporarily or permanently exempt customers from the provisions of this Ordinance, or impose reasonable conditions in lieu of compliance, if the General Manager finds that any of the following conditions exist:

9.1 Serious Economic Hardship

The requirements would cause an unnecessary and undue economic hardship upon the customer, threatening the customer's primary source of income as an individual or a business.

9.2 Adverse Impact on Health and Safety

Strict compliance would create an emergency condition, as determined by the General Manager, adversely affecting the health, protection or safety of the customer or the public.

10. APPEALS

Any person who is dissatisfied with any determination made under this ordinance may at any time within 30 days after such determination make an appeal. The first appeal will be made to the General Manager in writing. Should the applicant be dissatisfied with the decision of the General Manager, a subsequent appeal may be made to the Board of Directors of Directors within 30 days of the General Manager's decision.

10.1 Appeal to General Manager

Any person who is dissatisfied with any determination made under this ordinance may at any time within 30 days after such determination, appeal to the General Manager by giving written notice to the General Manager. The appeal shall set forth the events and circumstances leading to the appeal, the nature of the ruling or interpretation from which relief is sought, the nature of the impact of the ruling on the appellant's property or business, together with any other reasons for the appeal.

The General Manager shall investigate the matter appealed and shall make a written decision, which shall be mailed to the appellant within 30 days of receipt of the appeal. If the dispute involves an amount of charges, the appellant shall pay the amount disputed in full when the charges are due. Any charge paid under protest will be refunded to the appellant should the General Manager determine that the charges were wrongfully made.

10.2 Appeal to Board of Directors of Directors

Any person who is dissatisfied with any determination made by the General Manager may at any time within 30 days after such determination, appeal to the Board of Directors of Directors by giving written notice to the General Manager and to the Clerk of the Board of Directors of Directors. The appeal shall set forth the events and circumstances leading to the appeal, the nature of the ruling or interpretation from which relief is sought, the nature of the impact of the ruling on the appellant's property or business, together with any other reasons for the appeal.

The General Manager shall transmit to the Board of Directors of Directors a report upon the matter appealed. The Board of Directors of Directors may request that the appeal be agendized and consider all testimony and make a decision, which shall be mailed to the appellant within 30 days of the date of the Board of Directors action. The Board of Directors of Directors may, at any time, upon its own motion, revise any determination made by the General Manager.

If the dispute involves an amount of charges, the appellant shall pay the amount disputed in full when the charges are due. Any charge paid under protest will be refunded to the appellant should the Board of Directors of Directors determine that the charges were wrongfully made.

11. NOTICE OF VIOLATION

If any person fails or refuses to comply with the provisions of this ordinance, the General Manager or the manager's designee shall provide the person with a written notice of the violation and an opportunity to correct the non-compliance. The written notice will:

(a) Be posted or presented at the site of the noncompliance

(b) Be mailed to the customer

(c) State the time, date and place of the violation

(d) Provide a general description of the violation

(e) State the means to correct the violation

(f) State a date by which correction is required

(g) State the possible consequences of failing to correct the violation

If the violation is not corrected to the District's satisfaction within the time frame specified, the District may restrict the water service to the property or disconnect the service. In addition to correcting the violation, the customer may be billed administrative fees on their account.

11.1 PROCEDURES

11.1.1 First Violation

Following adoption of this ordinance, first violations will result in a friendly reminder in the form of a notice posted on or near the front door, personal contact with the customer, a phone call and/or a letter advising the customer of the violation, in accordance with Section 11 a through g.

11.1.2 Second Violation

For a second violation within one calendar year, the customer will be notified in writing in accordance with Section 11 a through g. If the correction is not made within thirty (30) days of the District's notice to the customer, the customer may be assessed a fine of $100. The fee shall be added to the customer's water service charges at the property where the violation occurred.

11.1.3 Third Violation

For a third violation within one calendar year, the customer will be notified in writing in accordance with Section 11 a through g. The customer may be assessed a fine of $200. The fee shall be added to the customer's water service charges at the property where the violation occurred. If not corrected within ten (10) days of written notice, a flow-restricting device may be installed on the customer's service connection, and the costs associated with the installation and removal will be billed on the customer's monthly water billing.

11.1.4 Fourth Violation

For the fourth and subsequent violations within one calendar year, the customer will be notified in writing in accordance with Section 11 a through g and the customer may be assessed a fine of $500. The fee shall be added to the customer's water service charges at the property where the violation occurred. In addition, a flow-restricting device may be installed on the customer's service connection, and the costs associated with the installation and removal will be billed to the customer.

If not corrected within ten (10) days of written notice, the District may discontinue the customer's water service at the property where the violation occurred in accordance with District procedures. Reconnection shall only be permitted when there is reasonable protection against future violations, as determined by the General Manager.

11.2 ENFORCEMENT COSTS

The District may correct any violation of this ordinance and bill the customer for costs and expenses in enforcing the provisions of this ordinance, including staff time for investigation and monitoring for compliance, if the customer refuses to comply. Charges shall be added to the customer's bill for the property where the enforcement costs were incurred. The District may also take such action as may be allowed by statute.

11.3 TERMINATION OF SERVICE

Failure to correct the violation may result in termination of water service to the parcel on which the violation occurred.

12. SEVERABILITY

If any section, paragraph, sentence, clause or phrase of this ordinance or any part thereof is for any reason held to be invalid, such decision shall not affect the validity of the remaining portions of this ordinance or any part thereof. The Board of Directors hereby declares that it would have passed each section, paragraph, sentence, clause or phrase thereof, irrespective of the fact that any one or more sections, paragraphs, sentences, clauses or phrases be declared invalid.

PASSED AND ADOPTED by the Board of Directors of Directors at a meeting duly called and held within the District on the tenth day of September 2014 by the following roll call vote:

AYES: Directors Aguera, Bender, Ellis, Hemig and Lalitois

NOES: None

ABSTAIN: None

ABSENT: None

TRUCKEE DONNER PUBLIC UTILITY DISTRICT

By________________________________

Tony Laliotis, President of the Board of Directors

ATTEST:

____

Michael D. Holley, Clerk of the Board of Directors

APPENDIX E

RESOLUTION 2016-20
ADOPTION OF THE URBAN WATER MANAGEMENT PLAN

TRUCKEE DONNER
Public Utility District

Resolution No. 2016 - 20

ADOPTION OF THE 2015 URBAN WATER MANAGEMENT PLAN

WHEREAS, the California Legislature enacted Assembly Bill 797 (Water Code Section 10610 et seq., known as the Urban Water Management Planning Act) during the 1983-1984 Regular Session, and as amended subsequently, which mandates that every supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre feet of water, prepare an Urban Water Management Plan, the primary objective of which is to plan for the conservation and efficient use of water; and

WHEREAS, the District is an urban supplier of water providing water to over 3,000 customers; and

WHEREAS, the Plan is periodically reviewed at least once every five years, and the Truckee Donner Public Utility District last reviewed and made amendments or changes to its plan on September 14, 2014; and

WHEREAS, the District has prepared and circulated for public review a draft 2015 Urban Water Management Plan, and a properly noticed public hearing regarding said Plan was held by the Truckee Donner Public Utility District on June 1, 2016; and

WHEREAS, provided that the Plan is adopted on June 1, 2016 after the public review and hearing, it will take effect on July 1, 2016 and be filed with the State of California within thirty days of adoption; and

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Truckee Donner Public Utility District as follows:

1. That the above recitations are true and correct.

2. That the 2015 Urban Water Management Plan is adopted.

3. That District staff is authorized and directed to file the 2015 Urban Water Management Plan with the State of California within thirty days of adoption.

PASSED AND ADOPTED by the Board of Directors of the Truckee Donner Public Utility District at a meeting held within said District on June 1, 2016 by the following roll call vote:

AYES: Directors: Ellis, Bender, Warmerdam, Laliotis, and President Aguera.
NOES: None.
ABSENT: None.

TRUCKEE DONNER PUBLIC UTILITY DISTRICT

By ______________________
Joseph Aguera, President

ATTEST:

____
Michael D. Holley, District Clerk

I, SHANNA D. KUHLEMIER, HEREBY CERTIFY THAT THE FOREGOING IS A TRUE AND CORRECT COPY OF Resolution 2016-20 AND FURTHER CERTIFY THAT SUCH DOCUMENT HAS NOT BEEN AMENDED OR REPEALED.