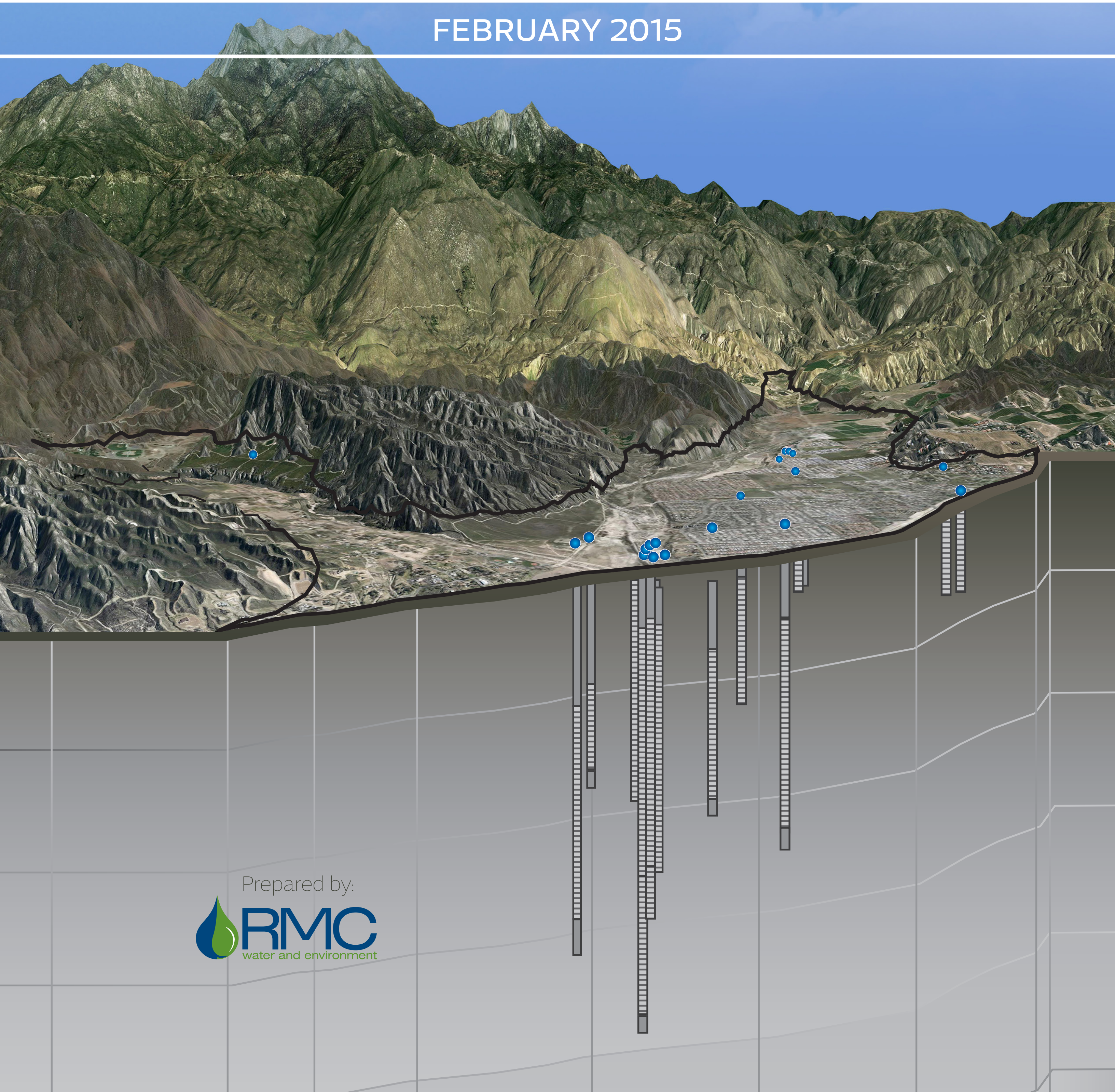
Lake Hemet Municipal Water District

Soboba Band of Luiseño Indians — Est. June 19, 1883

Eastern Municipal Water District — Since 1950

CANYON OPERATING PLAN

FEBRUARY 2015



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RMC water and environment

Canyon Operating Plan Report

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<u>Appendix</u>

List of Abbreviations and Acronyms

AF	acre feet
AFY	acre feet per year
Basin Plan	Water Quality Control Plan for the Santa Ana River Basin
bgs	below ground surface
Canyon Sub-Basin	Canyon Groundwater Management Zone
CAM	Consultants, Attorneys, and Managers Committee
CASGEM	California Statewide Groundwater Elevation Monitoring
CDPH	California Department of Public Health
cfs	cubic feet per second
DWR	California Department of Water Resources
EMWD	Eastern Municipal Water District
ft	Feet
Judgment	Stipulated Judgment and Complaint
LHMWD	Lake Hemet Municipal Water District
Management Area	Hemet / San Jacinto Groundwater Management Area
MCL	maximum contaminant level
mg/l	milligrams per liter
MOU	Memorandum of Understanding - Operating Plan for the Canyon Sub-Basin
msl	mean sea level
OWTS	onsite wastewater treatment system
PC	Policy Committee
Plan	Canyon Operating Plan
RCFCWCD	Riverside County Flood Control and Water Conservation District
RWRD	Regional Water Resources Database
Santa Ana RWQCB	Santa Ana Regional Water Quality Control Board
SMCL	secondary maximum contaminant level
Soboba Tribe	Soboba Band of Luiseño Indians
State Water Board	State Water Resources Control Board
TAC	Technical Advisory Committee
TDS	total dissolved solids
USGS	United States Geological Survey
Watermaster	Hemet-San Jacinto Watermaster

Executive Summary

The Canyon Groundwater Management Zone (Canyon Sub-Basin) is located in the southeastern portion of the San Jacinto Basin of Riverside County, California (Figure ES-1). The groundwater resources of the Canyon Sub-Basin are utilized for beneficial uses by numerous stakeholders: the Soboba Band of Luiseño Indians (Soboba Tribe), Lake Hemet Municipal Water District (LHMWD), Eastern Municipal Water District (EMWD), and private pumpers. The need to develop the Canyon Operating Plan (Plan) came as a result of the Memorandum of Understanding - Operating Plan for the Canyon Sub-Basin (MOU) that is related to the Settlement Agreement between the Soboba Tribe and the local municipal agencies.

The Settlement Agreement established the Soboba Tribe groundwater production rights at 9,000 acre-feet per year (AFY) from Intake (as defined in the Settlement Agreement, generally the southern portion of the Upper Pressure Sub-Basin, including the portion adjacent to the Canyon Sub-Basin) and Canyon Sub-Basins (both within the Hemet/San Jacinto Groundwater Management Area), of which at least 3,000 AFY must be made available for production directly from the Canyon Sub-Basin. If the Canyon Sub-Basin supplies are inadequate to meet the Soboba Tribe's annual production allocation, then EMWD and LHMWD will be required to provide a supplemental water supply directly to the Soboba Tribe to satisfy production rights demands.

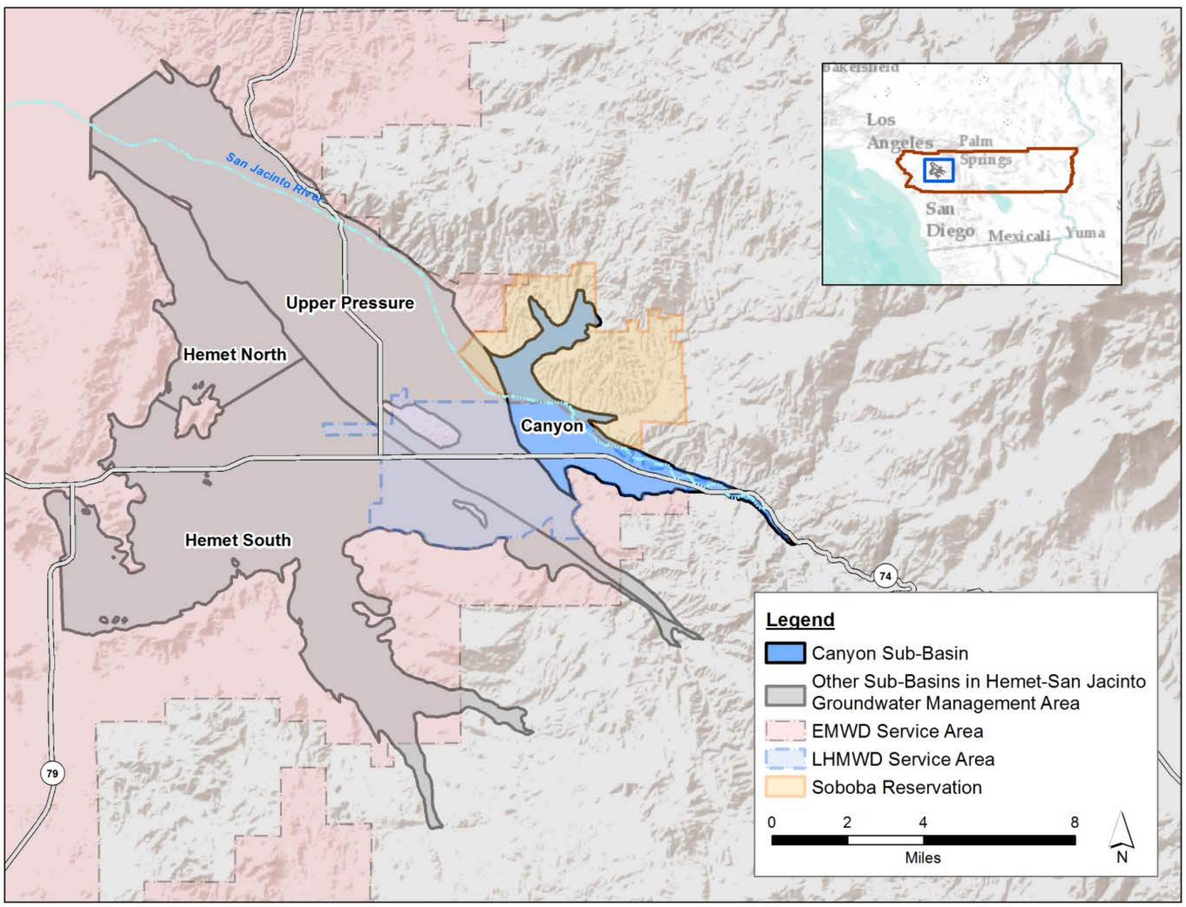


Figure ES-1: Location of Canyon Sub-Basin within the Hemet/San Jacinto Groundwater Management Area

In accordance with the requirements, EMWD, LHMWD, and the Soboba Tribe have a MOU to jointly develop this Canyon Operating Plan (see Appendix A). This plan was generated to meet the following goals.

- Guide and support responsible and sustainable water management
- Facilitate beneficial use of the basin and avoid shortages
- Document and analyze historical trends
- Provide trigger points and potential responses to low water levels in the basin
- Provide safe yield and storage curves
- Create a forum for open exchange of data between participants

In the event of conflict between the documents, this Plan is governed by the MOU and the Settlement Agreement between the Soboba Tribe and the local municipal agencies.

ES-1 Hydrology

Three surface water courses flow through the Canyon Sub-Basin and are important components of groundwater recharge. Poppet Creek and Indian Creek both feed into the San Jacinto River, which is the main water course in the Canyon Sub-Basin, flowing from the southeastern portion of the basin to the northwestern corner. The river is intermittent, generally flowing during the winter and spring months. Additional recharge occurs at the Soboba Pit, with water from the San Jacinto River system, and the Grant Avenue Ponds, with water from the State Water Project or the San Jacinto River system. The location of the Canyon Sub-Basin and the major hydrologic features are shown on Figure ES-2.

The Canyon Sub-Basin generally behaves as a closed groundwater basin, with the Claremont Fault a significant barrier to flow between the Canyon Sub-Basin and the Upper Pressure Sub-Basin until groundwater levels reach approximately 60 feet below grade. Significant flow can occur across the Claremont Fault when water levels are within 40 to 60 feet of the surface. Such conditions have historically occurred during wet periods when the Canyon Sub-Basin is fully saturated.

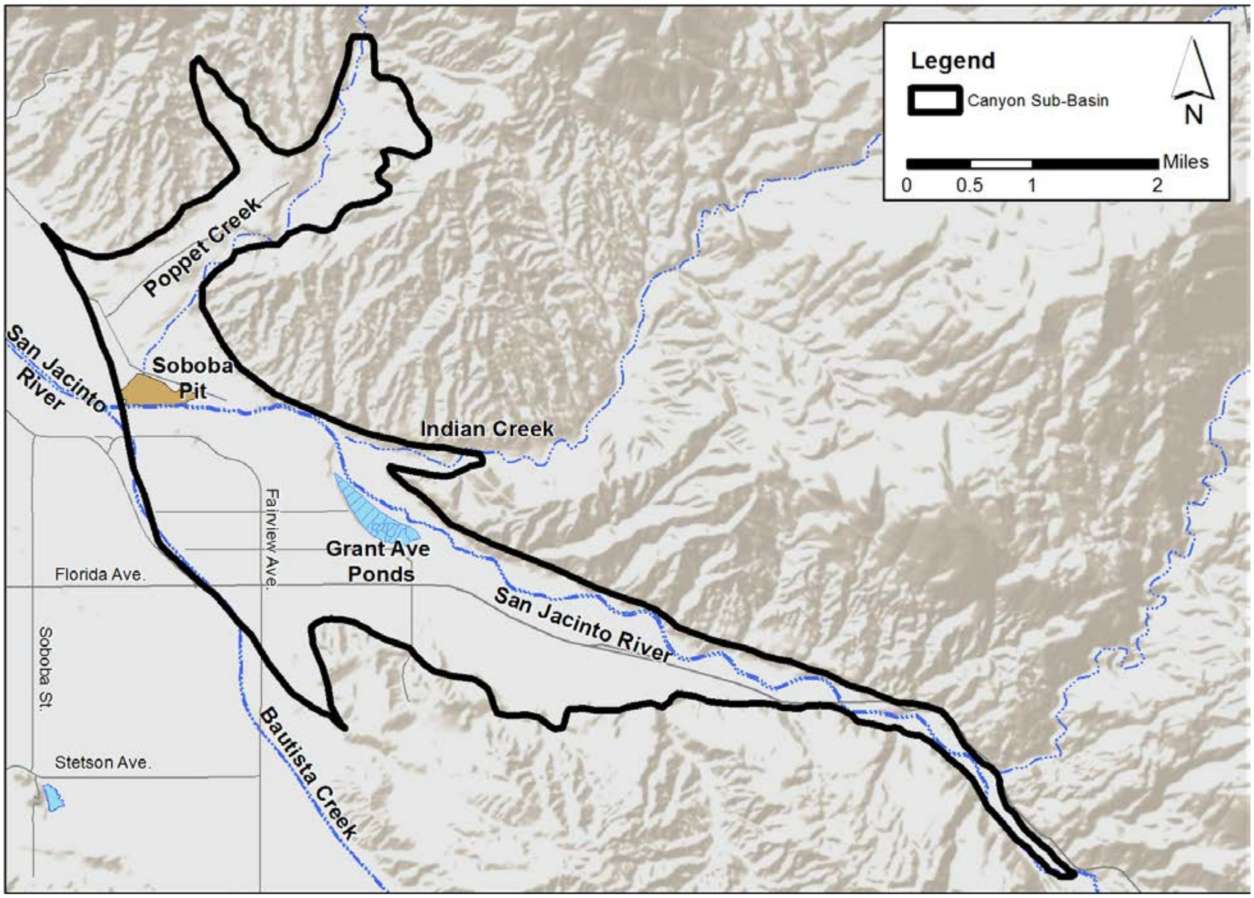


Figure ES - 2: Canyon Sub-Basin and Major Hydrologic Features

ES-2 Planning Yield

Planning Yield was developed for the sole purpose of managing groundwater in the Canyon Sub-Basin through this Plan. Planning Yield was defined by the Plan participants as:

> *A planning-level value representing the long term, average quantity of water supply in the Canyon Sub-Basin that can be produced without causing undesirable results, including the gradual reduction of natural groundwater in storage over long-term hydrologic cycles.*

Based on this definition, Planning Yield was estimated through a water balance approach. The estimation considered each of the following inflows to and outflows from the groundwater system:

- Inflows
  - Precipitation Recharge
  - San Jacinto River Recharge
  - San Jacinto River Tributaries Recharge
  - Artificial Recharge (only water of local origin from the San Jacinto River, which occurs at Grant Avenue Ponds, was included in the analysis)
  - Agricultural Applied Water Recharge, including areas served by LHMWD and the Soboba Tribe

  - o Municipal and Industrial (M&I) Use Recharge, including sewered areas served by LHMWD and areas with onsite wastewater treatment systems (OWTS or septic tanks) served by LHMWD and the Soboba Tribe
- Outflows
  - o Groundwater Production
  - o Subsurface Flow between Canyon and Upper Pressure

The change in groundwater in storage was estimated for each year within the recent, hydrologically balanced period of 1990 – 2012 by subtracting the volume of all outflows from the volume of all inflows. Annual Planning Yield estimates were then developed as the sum of the change in storage and the groundwater production during that year, as represented by the bars on Figure ES-3. Based on the definition and process above, the long-term estimate of Planning Yield was developed as the average value of the Annual Planning Yield estimates across the 1990 – 2012 time period: 10,100 AFY, as represented by the dashed line on Figure ES-3.

In addition to the long-term estimate of 10,100 AFY, the Annual Planning Yield estimates for the historical dry period of 1999 – 2002 were averaged to develop an estimate of dry period Planning Yield of 2,500 AFY, which was used to assist in defining the Critical Trigger, as discussed in ES-4.

Details of the analysis indicated that the bulk of recharge occurs from the San Jacinto River system (Figure ES-4) and the annual Planning Yield values were highly variable from year to year (Figure ES-3).

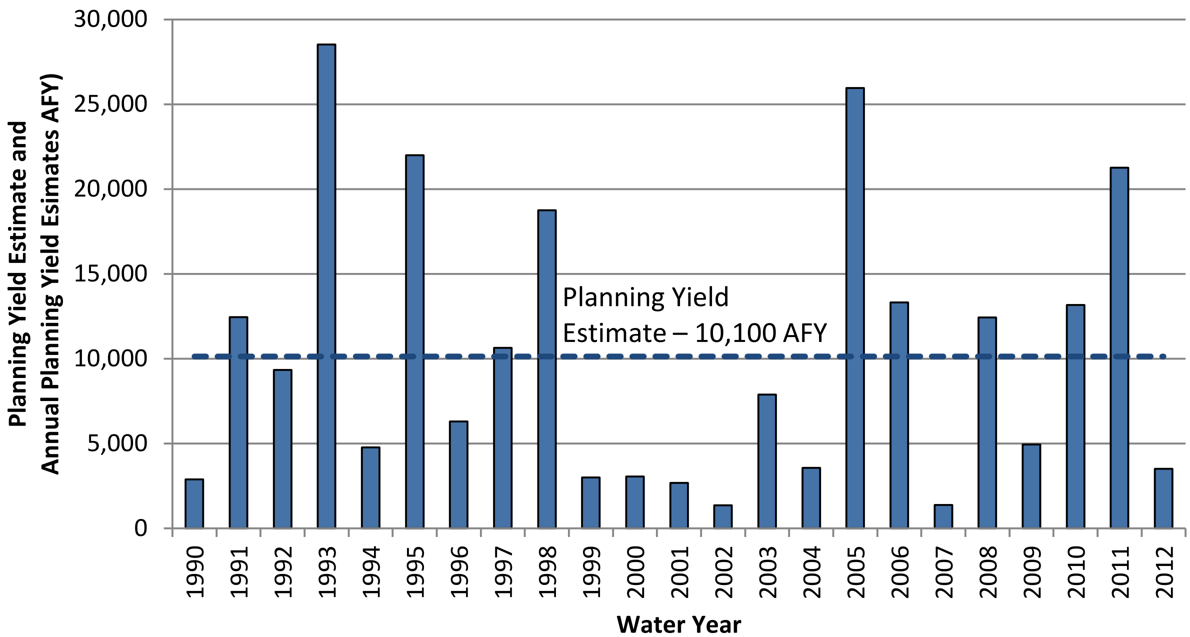


Figure ES - 3: Annual Variability within Planning Yield Estimate

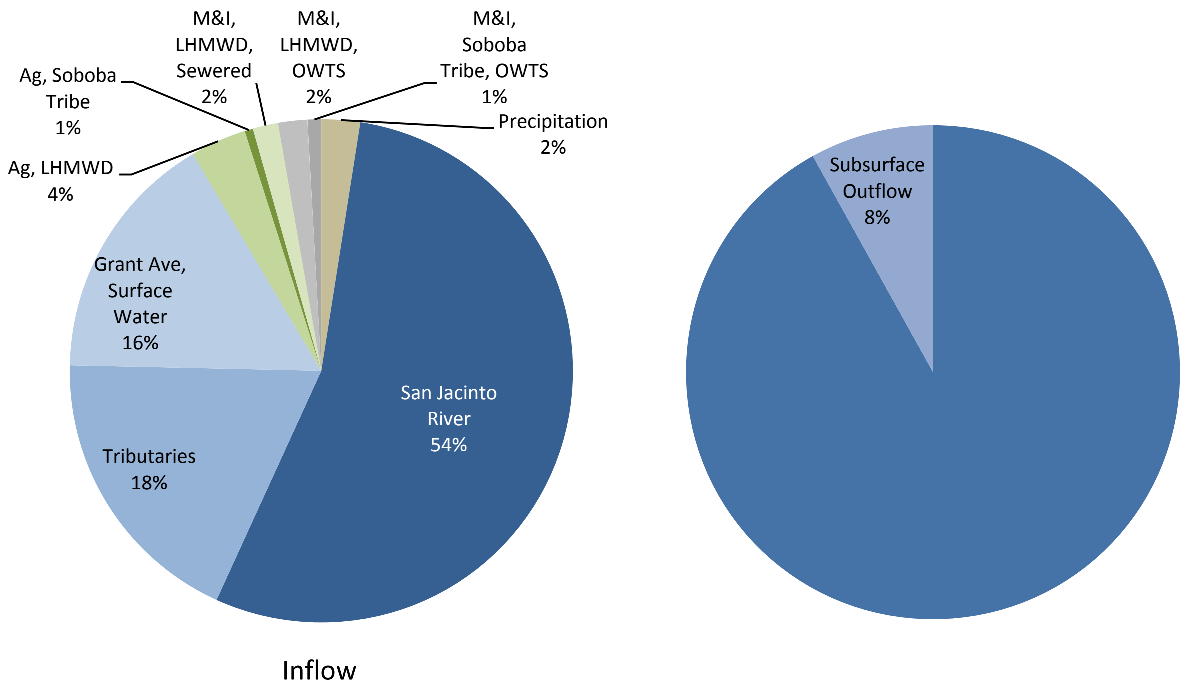


Figure ES - 4: Inflow and Outflow Components of Planning Yield

ES-3 Key Wells

To implement this Plan, three Key Wells were identified and will be monitored each spring for groundwater elevation. These Key Wells are the Soboba Tribe's DW-03, EMWD's Cienega 6, and LHMWD 16 (Figure ES-4). The three Key Wells were selected based on data availability and based on the historical relationship between groundwater elevations in the well and estimates of Planning Storage.

Every year on the first workday in April, the groundwater elevations at each Key Well will be measured and will be the basis to estimate basinwide Planning Storage in the Canyon Sub-basin for that year. The Planning Storage represents an estimate of groundwater in storage in the portion of the Canyon Sub-Basin aquifer that is readily accessible to groundwater wells. The groundwater elevation at each Key Well is related to an estimate of Planning Storage using a Planning Storage Curve. Basinwide Planning Storage is then estimated using a weighted average of the Planning Storage values at each of the three Key Wells, with a 50% weight for DW-03 and 25% weight for both Cienega 6 and LHMWD 16. The Planning Storage will be compared to the triggers defined herein that identify actions by the Participants.

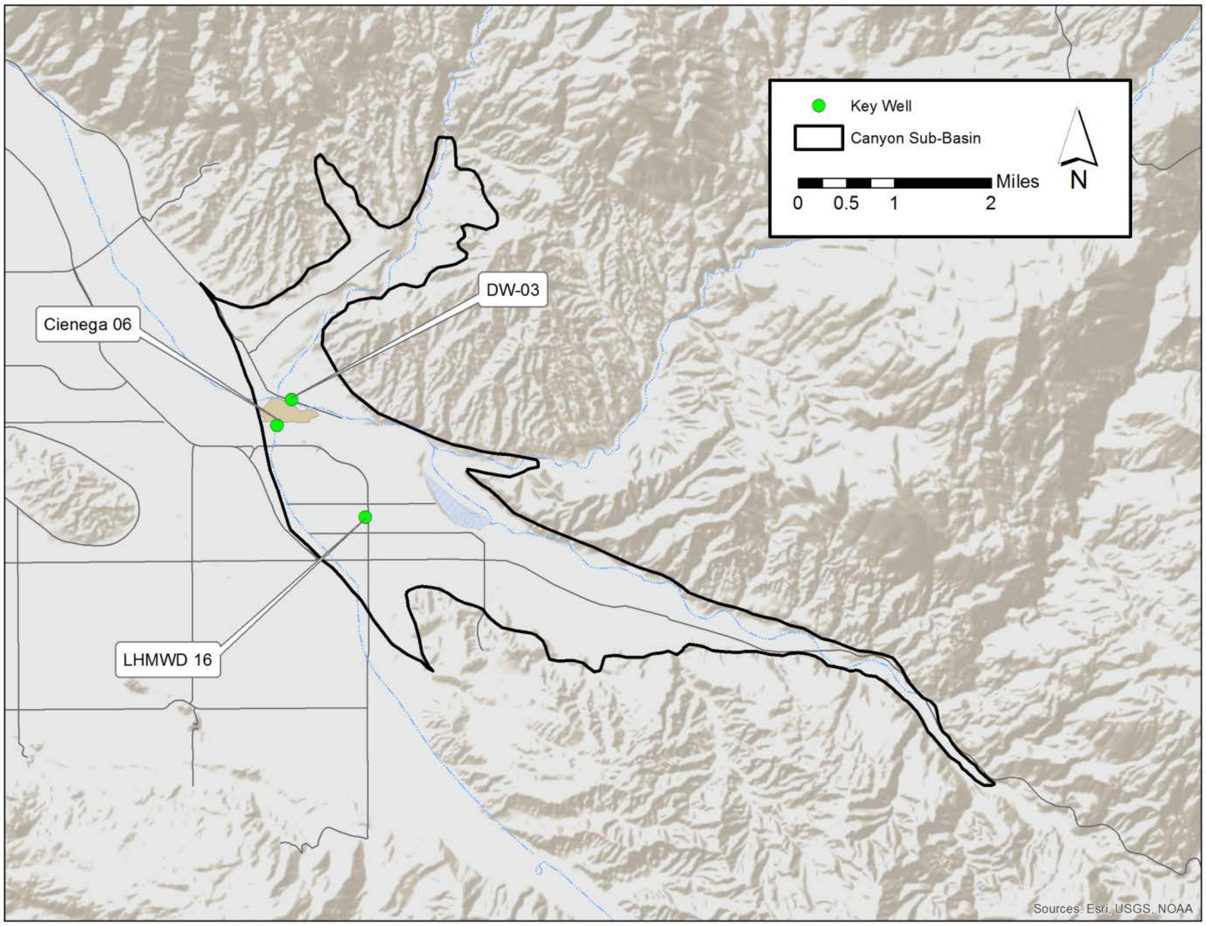


Figure ES - 5: Location of Key Wells

ES-4 Triggers and Actions

Triggers were developed to be protective of groundwater production for the Soboba Tribe wells, and other wells in the basin, while minimizing the operational impacts to EMWD and LHMWD, who would be required to reduce production, increase recharge, or supply supplemental water directly to the Tribe as a result of triggered actions. As an action level is triggered, EMWD and LHMWD may respond by reducing groundwater production or increasing recharge, or a combination of both. The result would be a change in Basinwide Net Production, which is defined as the difference between production and artificial recharge with imported water. Basinwide Net Production includes all artificial recharge by imported water, regardless of entity, and production by all wells, including private and Soboba Tribe wells. Actions to meet Basinwide Net Production trigger actions as part of this Plan will be taken by EMWD and LHMWD.

Triggers were developed for four different levels, resulting in increasingly aggressive responses should storage levels decline, and a more moderate response when storage levels are higher, as shown in Table ES-1 and Figure ES-5. As shown in Table ES-1, each trigger has an associated Planning Storage, which is estimated in April as described in section ES-3. The action was developed based on the Planning Yield Estimate and a planned recovery period. Moderate responses at relatively higher storage levels of the Proactive trigger were defined by using a Basinwide Net Production formula that would return the basin to 225,000 AF of Planning Storage over a 10-year period, given normal hydrology. More aggressive responses were defined for the Responsive and Near-Critical triggers by using a Basinwide Net Production formula that would return the basin to 225,000 AF of Planning Storage over a 4-year period, given normal hydrology. At the Critical trigger, there would be no Net Production of groundwater by EMWD and LHMWD from Canyon Sub-Basin, subject to certain limitations discussed below.

The ability to meet limitations defined through the trigger actions may not be possible at times due to insufficient available recharge water for the Canyon Sub-Basin and practical limits of the ability of agencies to shift to other alternative water sources. In situations where trigger actions cannot be met, the Participants would convene to discuss and coordinate options to optimize production for the Canyon Sub-Basin. Note that all recharge water must comply with Section 4.2 of the Settlement Agreement.

Table ES - 1: Triggers and Actions

Trigger Name	Planning Storage Trigger (AF)	Planned Recovery Period (Years)	Trigger Action: Basinwide Net Production (AF)
none	> 225,000	n/a	Unrestricted
Proactive	225,000 – 215,000	10	$10{,}100 - \left(\frac{225{,}000 - Planning\ Storage}{10}\right)$
Responsive	215,000 – 205,000	4	$10{,}100 - \left(\frac{225{,}000 - Planning\ Storage}{4}\right)$
Near Critical	205,000 – 197,000		
Critical	< 197,000	n/a	No Net Production of groundwater by EMWD and LHMWD from the Canyon Sub-basin, except as discussed in Subsection 6.3.3.5.

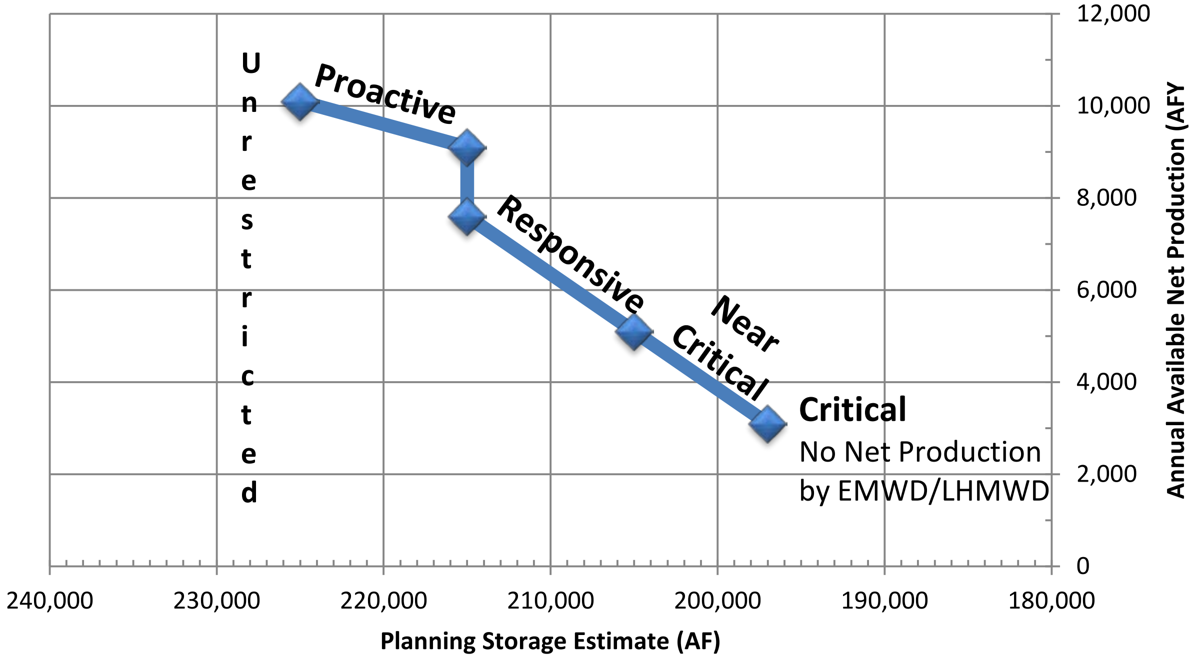


Figure ES - 6: Summary of Trigger Stages

ES-5 Plan Management

Management of the Plan includes regular monitoring, reporting, and updates of technical information and the Plan itself. Monitoring will be performed by the well owners and reported to the Reporting Entity, which is a working group of the Plan participants, led by EMWD. The Reporting Entity will be responsible for:

- Compiling data from the Key Well owners
- Circulating data to the Plan participants for confirmation
- Performing calculations to determine trigger status
- Identifying the trigger actions
- Documenting the above activities
- Documenting previous year's trigger actions, production, and recharge
- Circulating the documentation for review and comment
- Coordinating meetings and the sharing of the information with all Plan participants

It is anticipated that the plan itself will be updated periodically to ensure that the Canyon Sub-Basin is managed to provide the maximum benefit possible to the participants while still being protective of its long-term sustainability.

Section 1 Introduction

The Canyon Groundwater Management Zone (Canyon Sub-Basin) is located in the southeastern portion of the San Jacinto Basin of Riverside County, California. The groundwater resources of the Canyon Sub-Basin are utilized for beneficial uses by numerous stakeholders: the Soboba Band of Luiseño Indians (Soboba Tribe), Lake Hemet Municipal Water District (LHMWD), Eastern Municipal Water District (EMWD), and private pumpers. The need to develop the Canyon Operating Plan (Plan) came as a result of the Memorandum of Understanding - Operating Plan for the Canyon Sub-Basin (MOU) that is related to the Settlement Agreement between the Soboba Tribe and the local municipal agencies (see Appendix A).

The Settlement Agreement establishes the Soboba Tribe groundwater production rights at 9,000 acre-feet per year (AFY) from Intake (as defined in the Settlement Agreement, generally the southern portion of the Upper Pressure Sub-Basin, including the portion adjacent to the Canyon Sub-Basin) and Canyon Sub-Basins (both within the Hemet/San Jacinto Groundwater Management Area), of which at least 3,000 AFY must be made available for production directly from the Canyon Sub-Basin. If the Canyon Sub-Basin supplies are inadequate to meet the Soboba Tribe's annual production allocation, then EMWD and LHMWD will be required to provide a supplemental water supply directly to the Soboba Tribe. The more recent stipulated judgment between EMWD and the other basin rights holders allocates the remaining water rights in accordance with both the Hemet/San Jacinto Groundwater Management Area Water Management Plan and the Settlement Agreement.

In accordance with the requirements established in these documents, EMWD, LHMWD, and the Soboba Tribe have a MOU to jointly develop this Canyon Operating Plan. This Plan was generated to meet the following goals.

- Guide and support responsible and sustainable water management
- Facilitate beneficial use of the basin and avoid shortages
- Document and analyze historical trends
- Provide trigger points and potential responses to low water levels in the basin
- Provide safe yield and storage curves
- Create a forum for open exchange of data between participants

The development of the Plan was a collaborative process, with seven meetings attended by representatives of the Soboba Tribe, LHMWD, EMWD, and the Hemet-San Jacinto Watermaster (Watermaster). Meeting attendees are shown in Appendix B.

This Plan is intended to provide a framework for operating the Canyon Sub-Basin in a manner to avoid significant impacts to wells, including the Soboba Tribe wells, thus avoiding the costs associated with supplemental water delivery to the Soboba Tribe. Active management is intended to meet this goal while minimizing the impacts to EMWD, LHMWD, and their ratepayers. Minimization of impacts includes utilization of imported water from the State Water Project to be recharged in the Canyon Sub-Basin at the Grant Avenue Ponds. This usage of imported water for recharge to meet the goals of the Plan is particularly important to LHMWD, whose approval of the Plan is contingent on this ability to recharge. EMWD will support making such recharge at Grant Avenue Ponds a viable and low cost method of sustaining Canyon groundwater levels.

In the event of conflict between the documents, this Plan is governed by the MOU and the Settlement Agreement between the Soboba Tribe and the local municipal agencies.

Section 2 Basin Description

A brief introduction to the legal and institutional setting and the conceptual geology is provided below for background purposes.

2.1 Legal and Institutional Setting

2.1.1 Hemet/San Jacinto Groundwater Management Area

The Canyon Sub-Basin is located within the Hemet/San Jacinto Groundwater Management Area (Management Area), which is in the western portion of Riverside County, California, within the San Jacinto River Watershed, and includes the Cities of San Jacinto and Hemet, as well as the unincorporated areas of Winchester, Valle Vista, and Cactus Valley. The Management Area encompasses approximately 90 square miles and overlies four groundwater management zones: the Canyon, San Jacinto Upper Pressure, Hemet South, and the Hemet North portion of Lakeview/Hemet North. The location of the Canyon Sub-Basin within the larger Management Area is shown in Figure 2-1. (EMWD, 2014).

In June 2001, a memorandum of understanding between the California Department of Water Resources (DWR) and the local agencies was executed to cooperatively formulate a comprehensive water management plan for the Management Area. A Groundwater Policy Committee (PC) comprised of elected officials representing the Cities of Hemet and San Jacinto, LHMWD, EMWD, and representatives

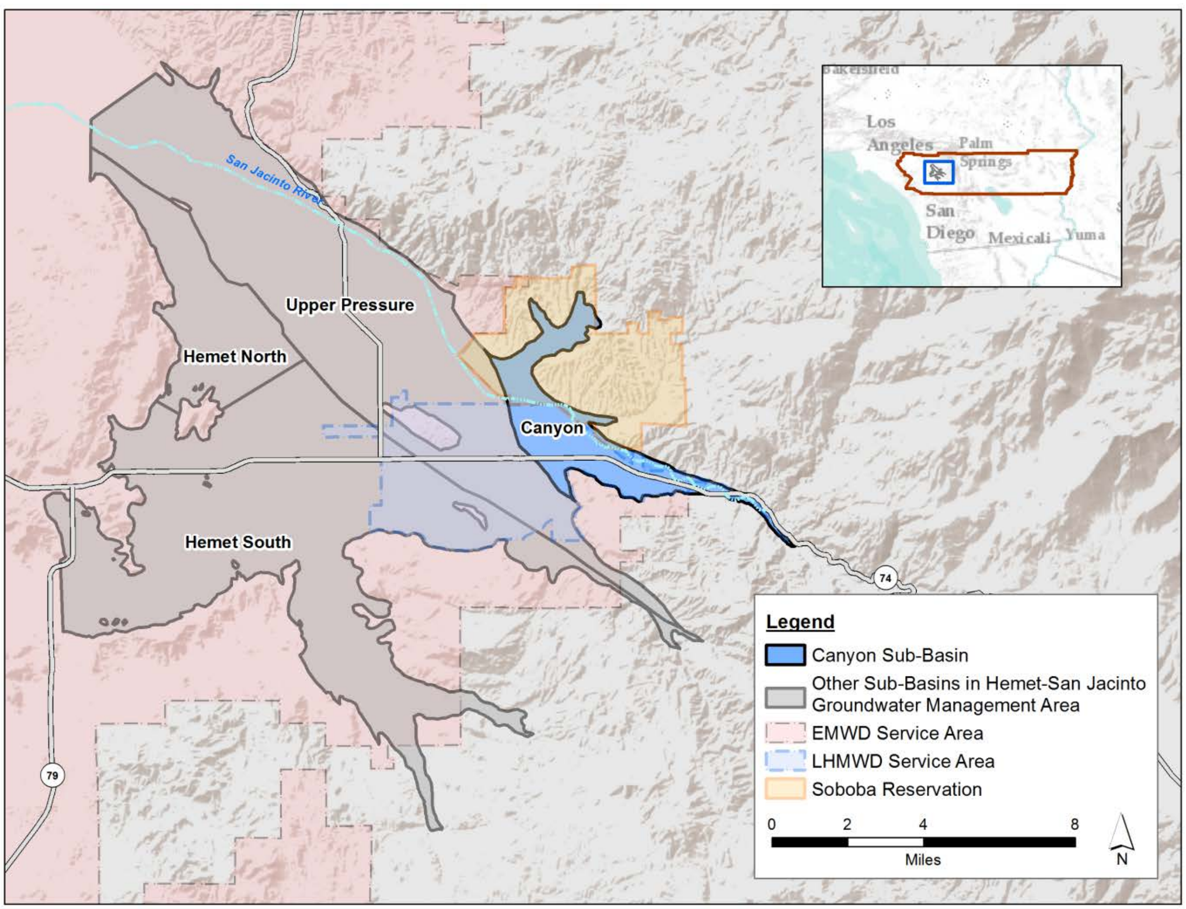


Figure 2-1: Location of Canyon Sub-Basin within the Hemet/San Jacinto Groundwater Management Area

of the private groundwater producers was formed. To evaluate available information, the PC formed a Technical Advisory Committee (TAC) to compile, share, interpret, and reach agreement on data; define problems; and provide guidance. The PC also formed the Consultants, Attorneys, and Managers (CAM) Committee to develop contractual agreements, side agreements, and memorandums of understanding; evaluate the financial impacts on the community; and provide administrative or policy recommendations to the PC. DWR acted as a facilitator for the PC and brought in an outside consultant to assist the TAC and CAM.

Through a collaborative effort, the TAC developed the data set that provided the basis for understanding the area's hydrology and identified potentially feasible initiatives, programs, and projects to enhance the dependable yield of the groundwater management zones. The PC and CAM analyzed, discussed, and debated issues of concern that had been on the table for half a century without resolution. The Water Management Plan was released in November 2007.

The Water Management Plan, adopted by the governing bodies of the Water Management Plan participants, has eight primary goals:

- Address groundwater production overdraft and declining groundwater levels
- Provide for Soboba Band of Luiseño Indians' prior and paramount water rights
- Ensure reliable water supply
- Provide for planned urban growth
- Protect and enhance water quality
- Develop cost-effective water supply
- Provide adequate monitoring for water supply and water quality
- Supersede the Fruitvale Judgment and Decree

The groundwater safe yield of the Management Area was estimated to be 40,000 to 45,000 AFY as reported in the Water Management Plan (WRIME, 2007). The estimate was partially based on a study of Operational Yield (WRIME, 2003), which was defined as the long-term withdrawal from the groundwater basin not exceeding natural and artificial recharge to the basin. The Water Management Plan also estimated the long-term basin overdraft to be at least 10,000 acre feet (AF).

In April 2013, a Stipulated Judgment (Judgment), Case Number RIC 1207274, was entered with the Superior Court of the State of California for the County of Riverside, creating the Watermaster. The Watermaster Board replaced the PC as the governing body for the Management Area and is comprised of elected officials representing the Cities of Hemet and San Jacinto, LHMWD, EMWD, and a representative for the private groundwater producers. The Watermaster adopted the Water Management Plan at the April 22, 2013 meeting of the Watermaster Board.

2.1.2 Water Quality Control Plan for the Santa Ana River Basin

The Canyon Sub-Basin is located within the jurisdiction of the Santa Ana Regional Water Quality Control Board (Santa Ana RWQCB), whose Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) sets water quality standards for the ground and surface waters of the region. For Canyon Sub-Basin groundwater, these standards include water quality objectives for total dissolved solids (TDS) of 230 mg/l and for nitrate (as nitrogen) of 2.5 mg/l (Santa Ana RWQCB, 2011). These water quality objectives are lower than elsewhere in the Management Area and reflect the high quality of groundwater in the Canyon Sub-Basin.

2.1.3 California Statewide Groundwater Elevation Monitoring Program

DWR's Bulletin 118 includes the Canyon Sub-Basin within the San Jacinto Groundwater Basin. DWR administers the California Statewide Groundwater Elevation Monitoring (CASGEM) program, which mandates a statewide groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. This monitoring is performed through collaboration between local monitoring entities and DWR. EMWD is the designated monitoring entity for the San Jacinto Basin, meaning that it has voluntarily taken responsibility for coordinating groundwater level monitoring and data reporting for the CASGEM program.

2.2 Conceptual Geology

The Canyon Sub-Basin is bounded on the west by the Claremont Fault and is otherwise bounded by the San Jacinto Mountains. The Claremont Fault is a significant barrier to flow between the Canyon Sub-Basin and the Upper Pressure Sub-Basin until groundwater levels reach approximately 60 feet below grade, with groundwater levels typically more than 200 feet higher in the Canyon Sub-Basin than in the Upper Pressure Sub-Basin. The fault is not a barrier to flow in the more recent deposits within approximately the upper 40 to 60 feet of the subsurface. Historically, the area in the Canyon Sub-Basin above the Claremont Fault was subject to rising water caused by the low-conductivity fault and the significant recharge from the San Jacinto River above the fault. These conditions resulted in the area being termed the “cienega,” or “swamp” in Spanish. Alluvium from the San Jacinto River and its tributaries are the primary water-bearing materials in the basin, with the deeper Bautista Formation yielding lower volumes of water. The maximum depth of the alluvial basin is not known, as bedrock has not been encountered in any of the wells in the central portion of the basin. Significant faulting and folding complicates the basin geology, particularly within the Bautista Formation, as shown in Figure 2-2 and Figure 2-3 (with location information shown in Figure 2-4), represented by Onderdonk (2012). This faulting and folding is thought to result in rising groundwater in portions of the alluvial aquifer, noted by increases in riparian vegetation along the San Jacinto River.

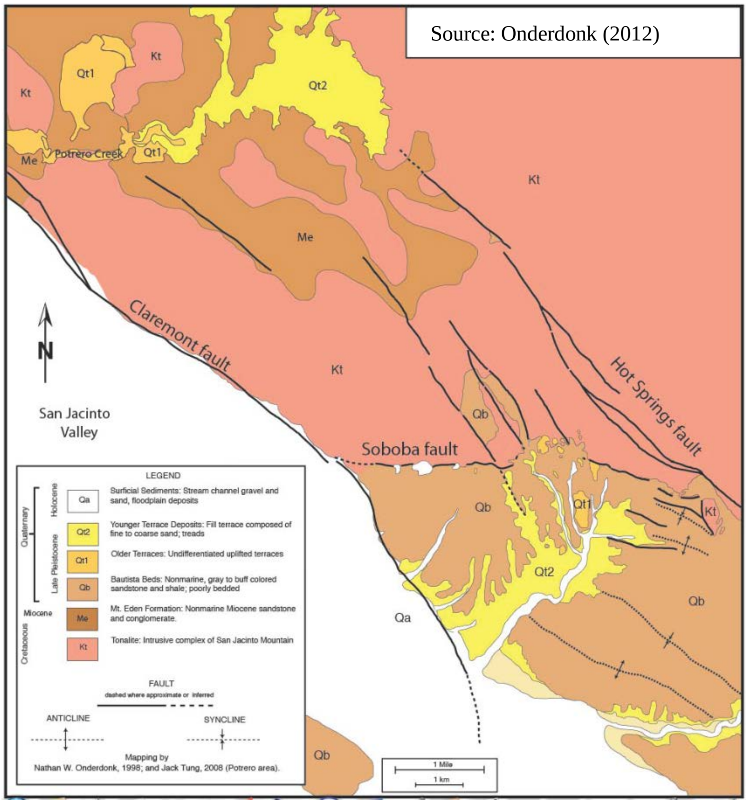


Figure 2-2: Canyon Sub-Basin Area Geologic Map, Northwestern Portion

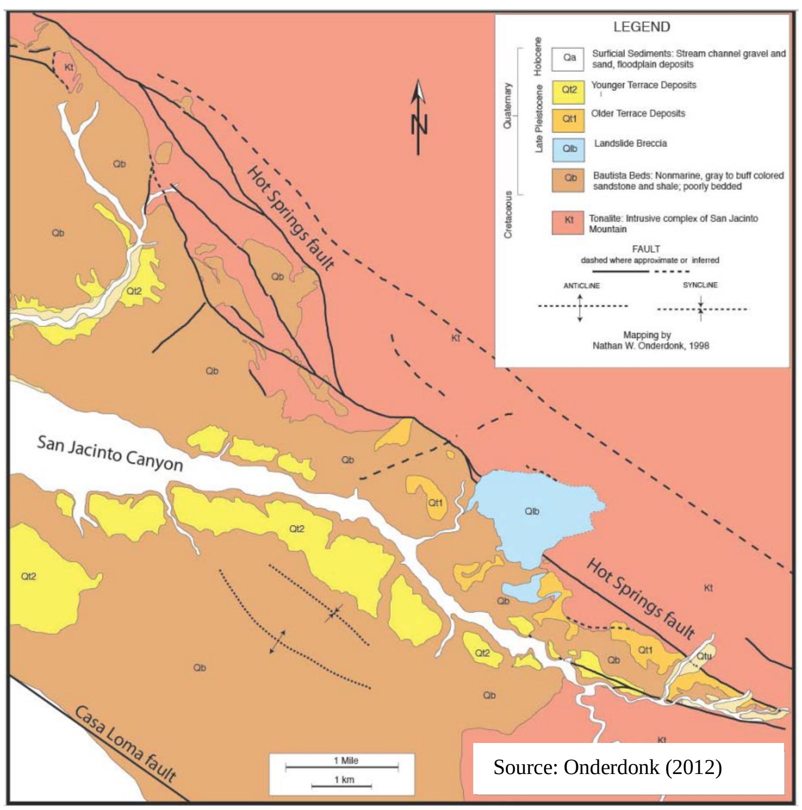


Figure 2-3: Canyon Sub-Basin Area Geologic Map, Southeastern Portion

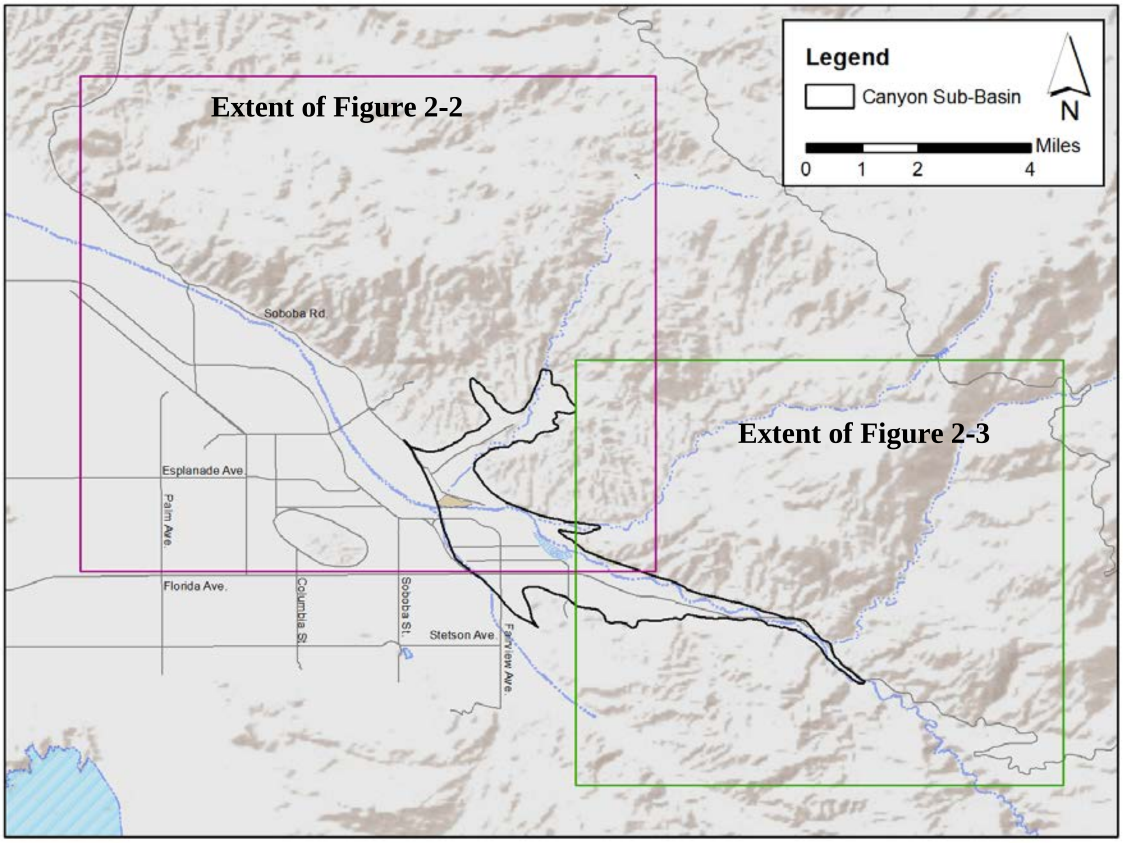


Figure 2-4: Location of Geologic Maps

Section 3 Current and Historical Conditions

A description of current and historical conditions is provided below for surface hydrology, groundwater production, groundwater levels, and groundwater quality. Data are presented for the full period of record for surface water flow, precipitation, and groundwater elevation. Data for groundwater production and groundwater quality are presented for 1984 - 2013 as these local data sources are generally of higher quality and of higher frequency during this period. Additionally, the 1984 – 2013 time period includes the "Near-Term Average" time period utilized in a previous study of Operational Yield (WRIME, 2003), 1984 – 2001.

3.1 Surface Hydrology

3.1.1.1 Rivers and Streams

Three surface water courses flow through the Canyon Sub-Basin and are important components of groundwater recharge. Poppet Creek and Indian Creek both feed into the San Jacinto River (see Figure 3-1), which is the main water course in the Canyon Sub-Basin, flowing from the southeastern portion of the basin to the northwestern corner. The river is intermittent, generally flowing during the winter and spring months. Both LHMWD and EMWD retain surface water diversion rights from the San Jacinto River.

Streamflow has been measured on the San Jacinto River at two locations in and near the Canyon Sub-Basin: an upstream location at the Cranston Gauge (United States Geological Survey [USGS] Gauge Number 11069500) and a downstream location at the State Street Gauge (USGS Gauge Number 11070150). Details of these gauges are provided in Table 3-1, and the locations are shown in Figure 3-2. Photographs of the Cranston Gauge and the State Street Gauge are shown in Figure 3-3 and Figure 3-4, respectively. Gauges have also measured streamflow at several locations over time on Bautista Creek, which is slightly outside of the Canyon Sub-Basin and is tributary to the San Jacinto River upstream of the State Street Gauge.

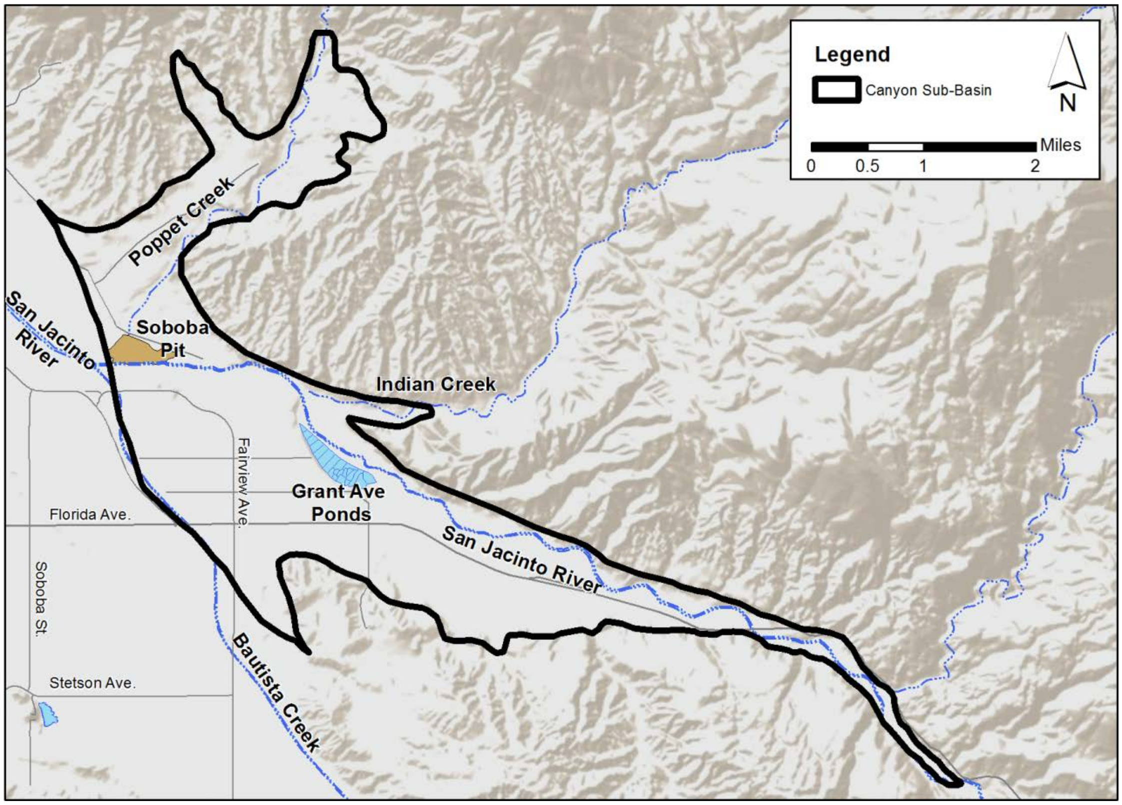


Figure 3-1: Major Hydrologic Features

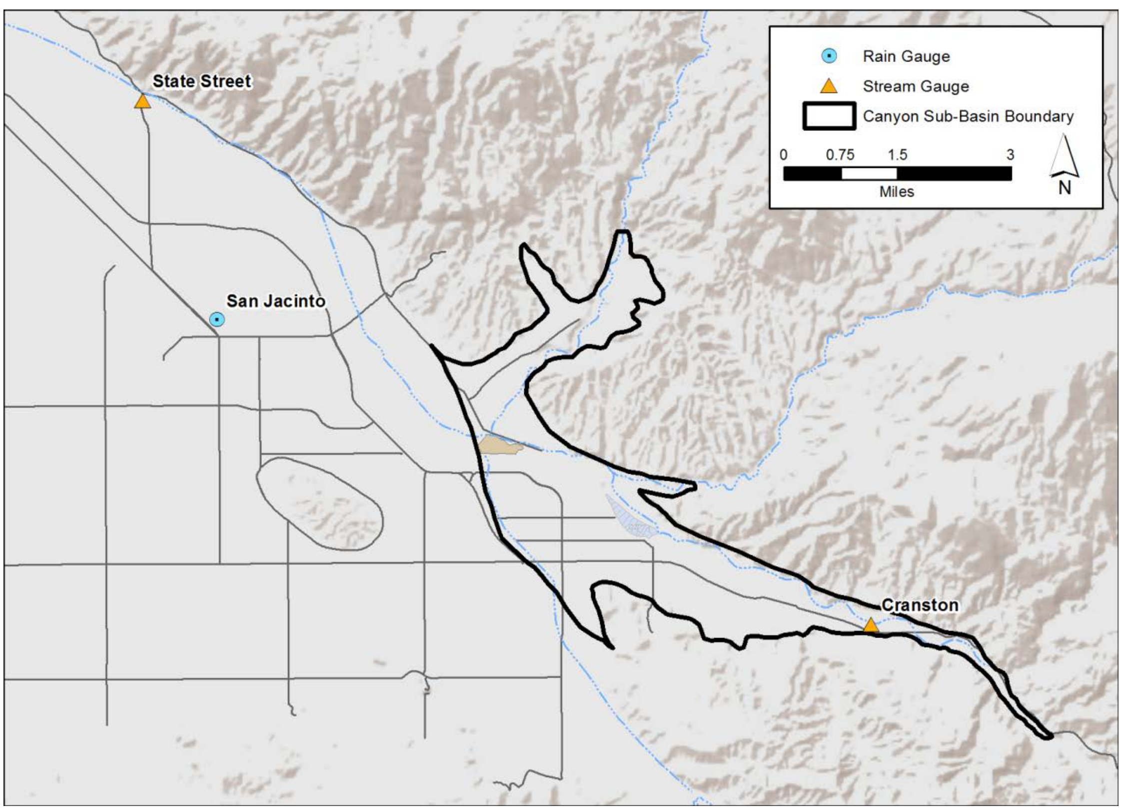


Figure 3-2: Streamflow and Rain Gauge Locations

Table 3-1: Canyon Sub-Basin Area Streamflow Gauges

USGS Gauge Number	USGS Gauge Name	Local Name	Period of Record, Stream Discharge
11069500	SAN JACINTO R NR SAN JACINTO	Cranston Gauge	October 1920 to September 1991, October 1996 to current year.
11070150	SAN JACINTO R AB STATE STREET NR SAN JACINTO CA	State Street Gauge	October 1996 to September 2006, October 2006 to current year, stage only

Figure 3-3: Cranston Gauge

Figure 3-4: State Street Gauge

Streamflow measured at the Cranston Gauge is highly variable, both seasonally and from year-to-year. Figure 3-5 shows this variability, with significantly higher streamflows in the spring, little streamflow in the fall, and variability between years. While the Cranston Gauge is the best available source of streamflow data in this area, the USGS (2014) indicates that the records are poor and the Plan participants question the accuracy of the data.

Streamflow in the San Jacinto River is significantly lower downstream of the Canyon Sub-Basin. This is shown through flows recorded at the upstream (Cranston Gauge) and downstream (State Street Gauge) gauges, particularly during low-flow conditions, as presented in Figure 3-6 based on data from the USGS (2014). In the ten year shared period of record, only 4 months recorded total flows above 10 cubic feet per second (cfs) at the State Street Gauge, while during the same period the Cranston Gauge recorded 26 months above 10 cfs. This is the case even though the State Street Gauge also captures flow from the Bautista Creek watershed. Much of the streamflow seen at the Cranston Gauge recharges groundwater prior to reaching the State Street Gauge, largely within the Canyon Sub-Basin streambed or in the Soboba Pit. The Soboba Pit captures all but the highest flows and allows for this water to recharge groundwater. The location of the Soboba Pit is shown in Figure 3-1 and a photograph of the pit during dry periods (January 2014) is shown in Figure 3-7.

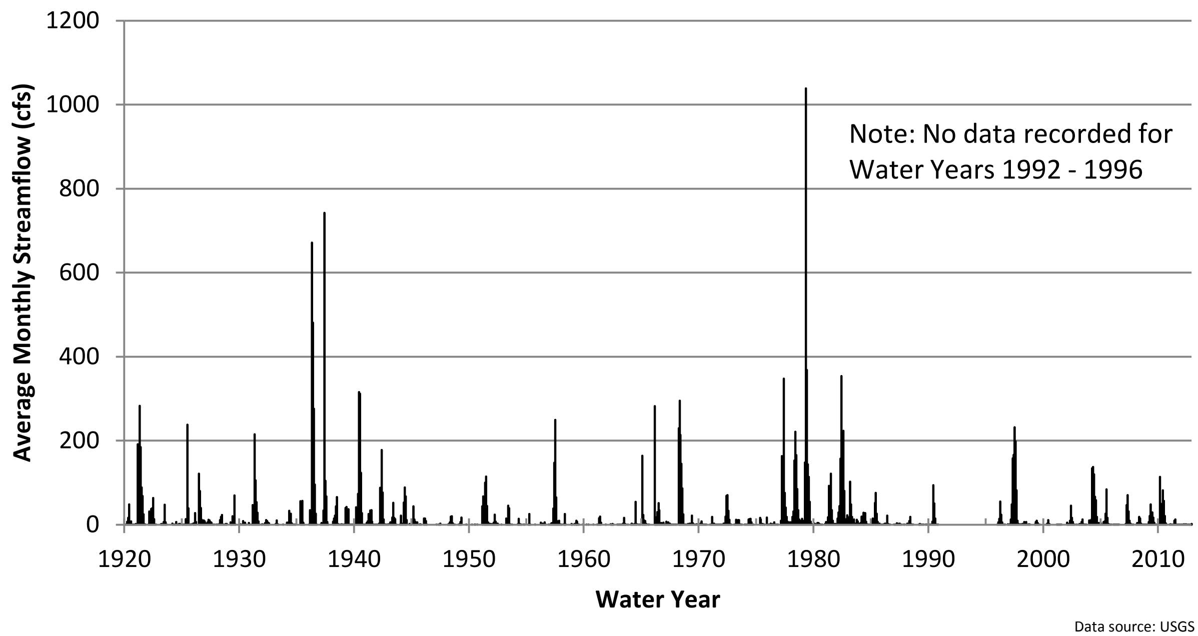


Figure 3-5: Historical San Jacinto River Streamflow, Cranston Gauge, 1920 – 1991 and 1997 - 2013

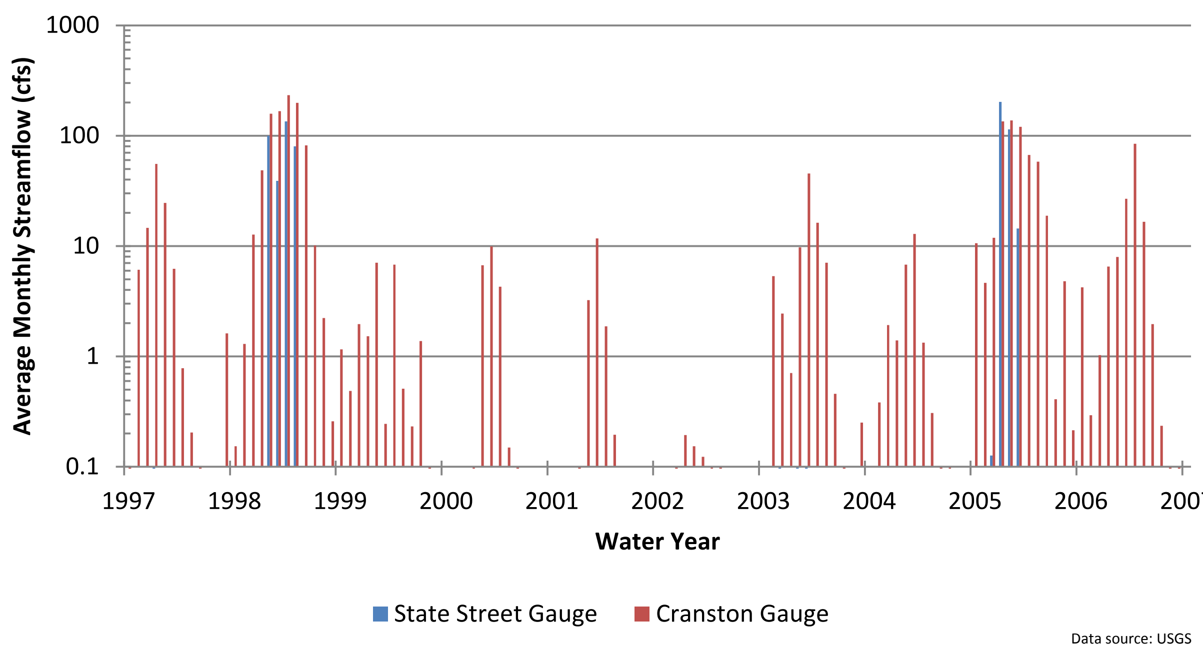


Figure 3-6: Historical San Jacinto River Streamflow, State Street Gauge, 1997 - 2006

Figure 3-7: Soboba Pit

3.1.1.2 Precipitation

Like much of Riverside County, Canyon Sub-Basin is a semi-arid environment, with a long-term average rainfall of 12.8 inches per year as recorded at the Riverside County Flood Control and Water Conservation District’s (RCFCWCD) San Jacinto gauge (#186) (see Figure 3-2). Due to orographic influences, precipitation on the valley floor within the Canyon Sub-Basin is likely somewhat lower than that recorded at the San Jacinto gauge and precipitation in the mountainous watershed is significantly higher (see Figure 3-8). This higher level of precipitation in the upper watershed contributes to the importance of stream recharge to the groundwater system. Precipitation is variable from year to year, and recent years have been generally dry, with 8 years out of the 10 year period from 2004 – 2013 recording rainfall below the long-term average (see Figure 3-9).

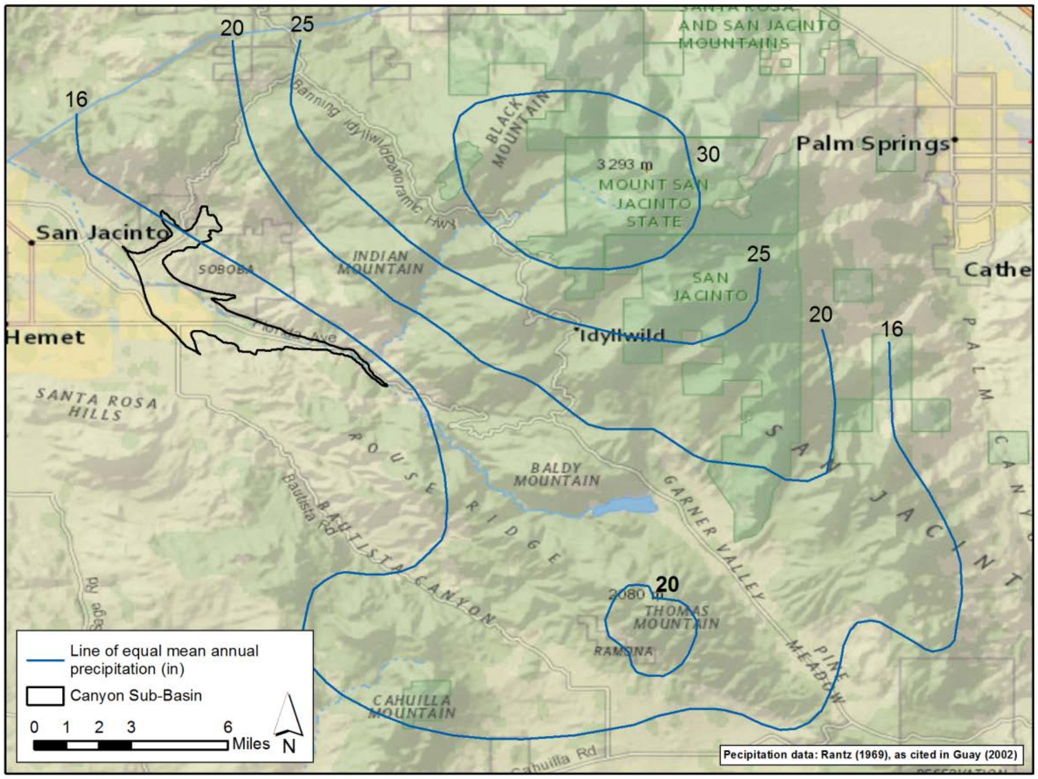


Figure 3-8: Distribution of Average Annual Precipitation

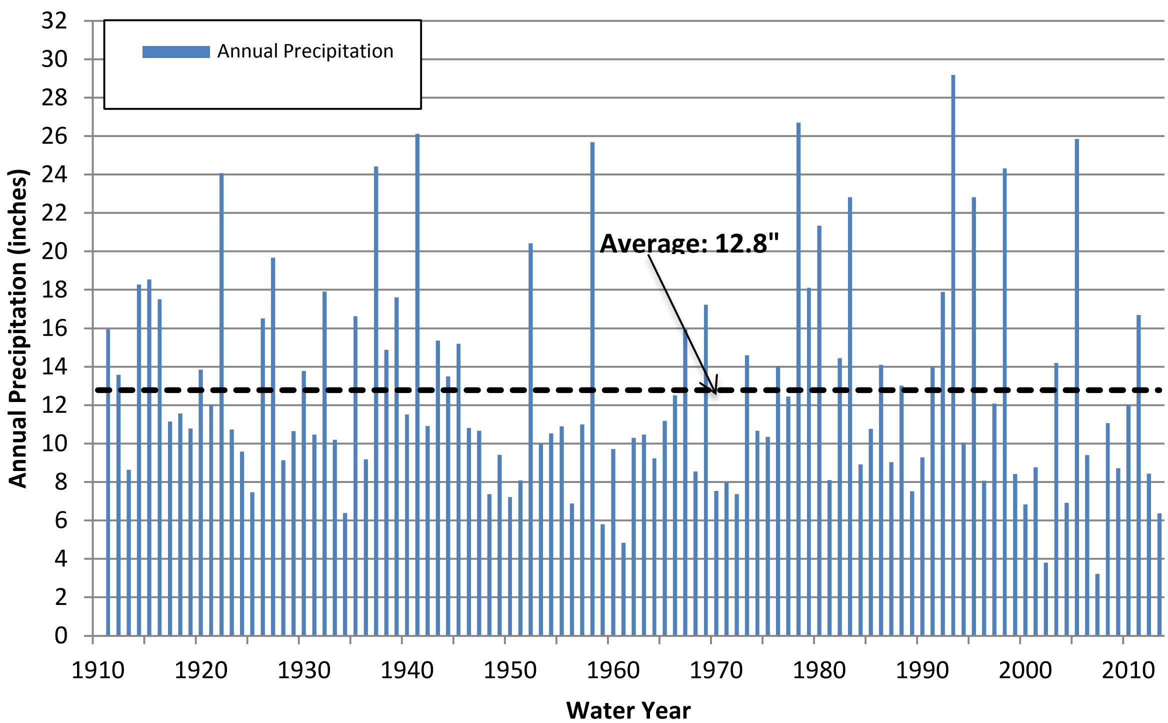


Figure 3-9: Annual Precipitation, San Jacinto Gauge

3.1.1.3 Recharge

The primary source of recharge to the Canyon Sub-Basin is through natural recharge from streams and precipitation and return flows from agricultural and municipal users. At times, artificial recharge at the Grant Avenue Recharge Ponds has also contributed to the basin. EMWD retains surface water diversion rights from the San Jacinto River and periodically diverts water to the Grant Avenue Ponds. Imported water can also be recharged at the ponds, although this resource is not always available due to limited supplies. Water is not recharged at the basins every year, as shown in Figure 3-10. The location of the Grant Avenue Ponds is shown on Figure 3-1.

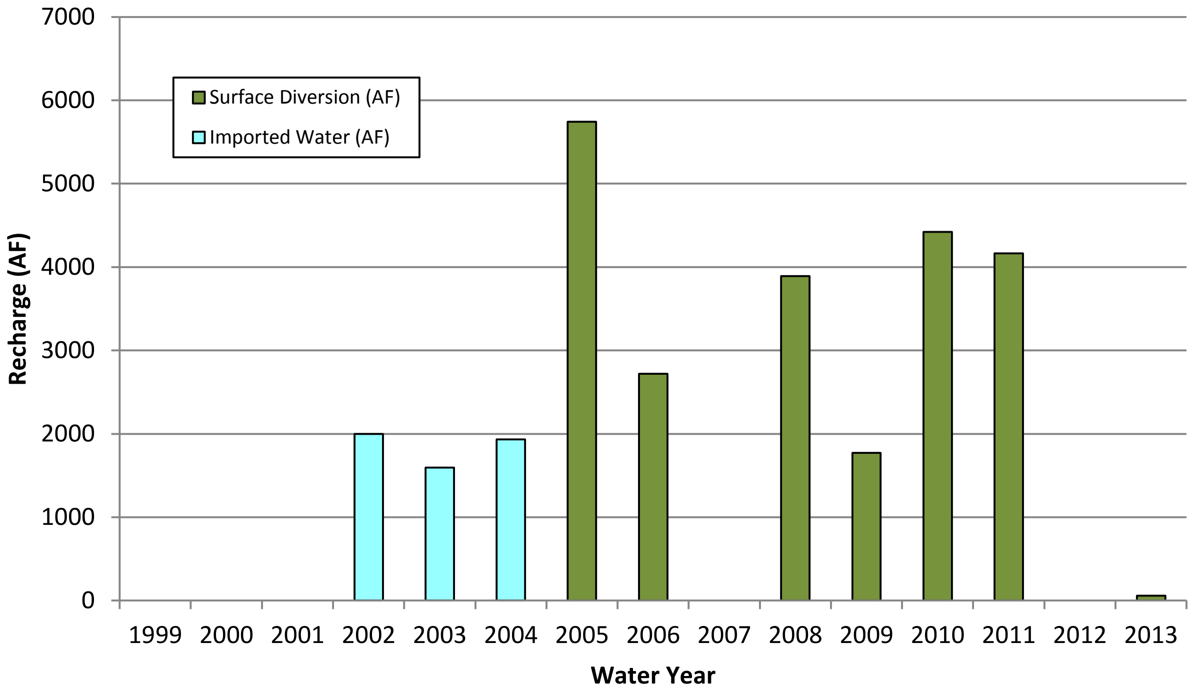


Figure 3-10: Recharge to Grant Avenue Ponds (1999 - 2013)

3.2 Groundwater Production

The Canyon Sub-Basin has four major groundwater producers with a combined 24 production wells active during the 1984 – 2013 period, as shown in Figure 3-11. Figure 3-12 shows the production and monitoring wells in the basin. These wells are owned and operated by EMWD, LHMWD, the Soboba Tribe, and several private pumpers. Groundwater production rates in the basin have fluctuated over time, with peak production rates occurring during water years 1986, 1997, and 2006, and subsequent reduction in production, as seen in Figure 3-13. With the exception of the year 2013, groundwater production in the basin has been declining since 2006. The production values may continue to decrease as EMWD and LHMWD are required by stipulated judgment to reduce Adjusted Production Rights[1] of native water by up to 10% per year until the estimated safe yield levels are achieved within the overall Management Area.

[1] Adjusted Production Rights are water rights of a Public Agency or participant as set forth in the stipulated judgment.

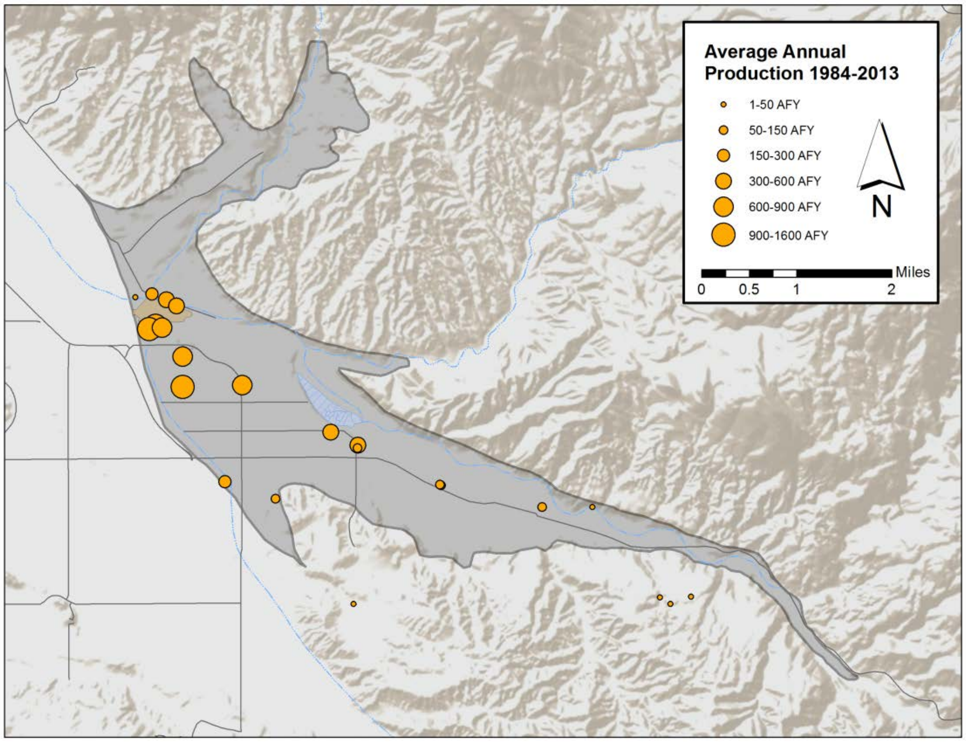


Figure 3-11: Groundwater Production Wells in Canyon Sub-Basin

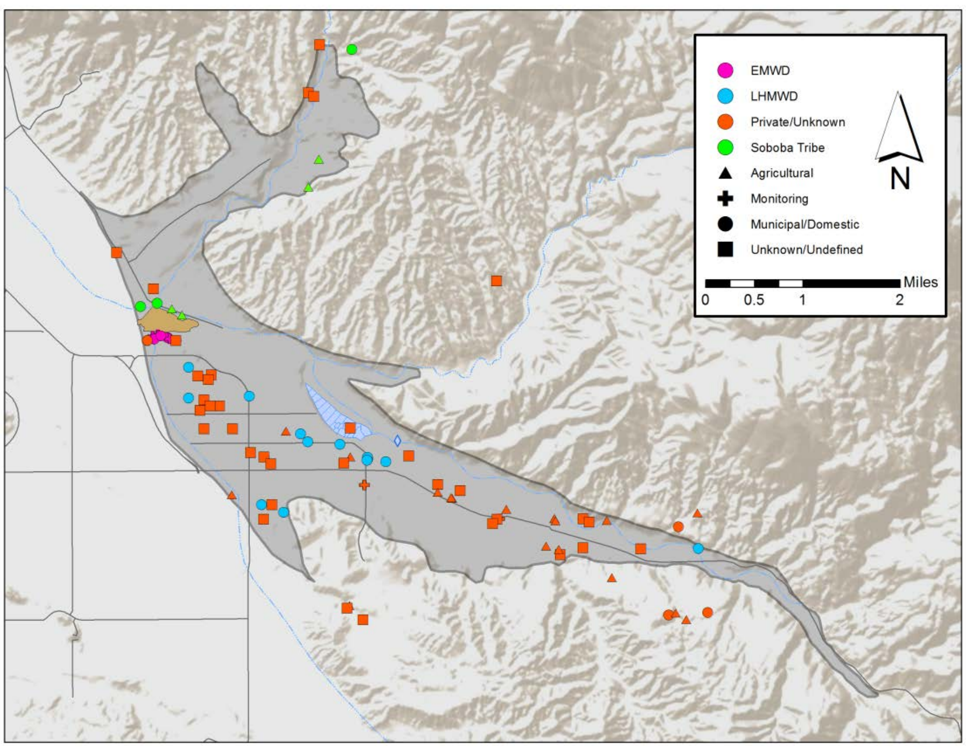


Figure 3-12: Groundwater Wells in Canyon Sub-Basin

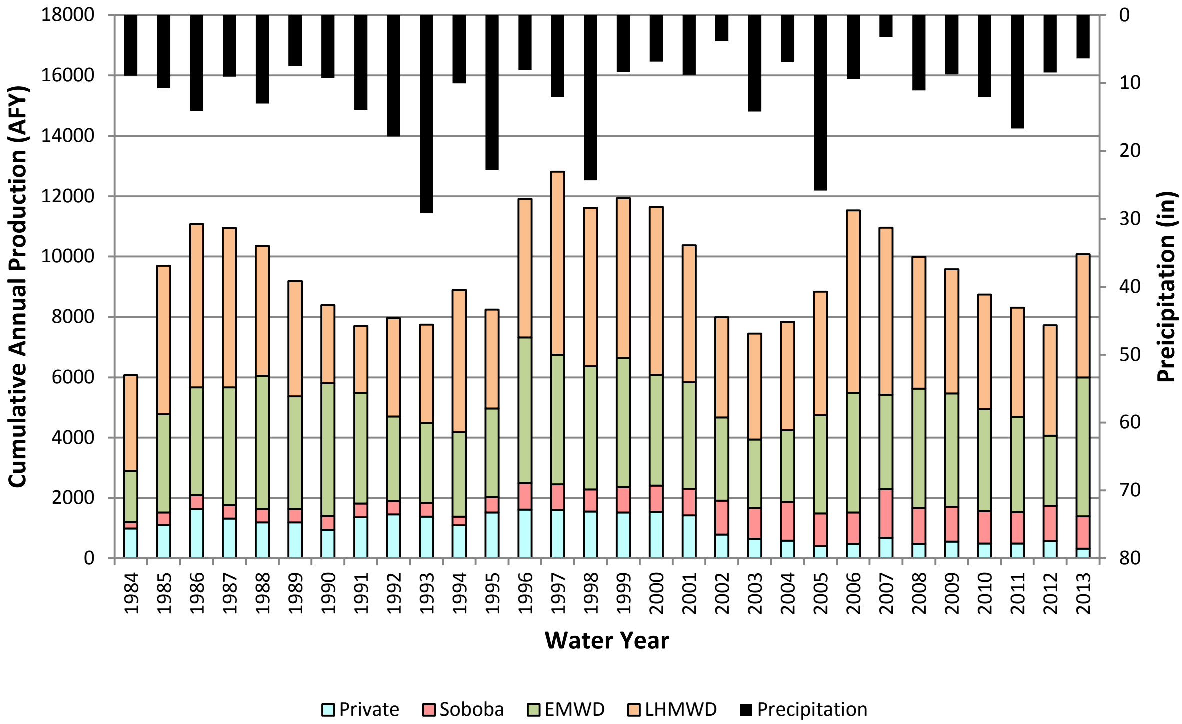


Figure 3-13: Historical Production in the Canyon Sub-Basin (1984 - 2013)

On average, EMWD and LHWMD produce the majority of the groundwater from the basin, averaging approximately 3,400 AFY and 4,200 AFY, respectively, over the 1984 to 2013 period. This amounts to approximately 80% of the average groundwater produced in the basin. From 1984 to 2013, EMWD and LHMWD production volumes have remained generally constant, while the Soboba production has increased over time, based on statistical analysis using the Mann-Kendall test[2]. Private pumpers displayed the opposite trend with decreasing production during this time.

Typically, all producers have higher production rates during the summer months when water demands are high and decrease production during the winter months. Table 3-2 provides average production rates in the basin from 1984 to 2013. The 1984 to 2013 time period is presented due to the significantly better data record for groundwater production available starting around 1984.

Table 3-2: Groundwater Production Wells and Average Production Rates, 1984 - 2013

Producer	Wells	Average Production from 1984 - 2013 (AFY)
EMWD	3	3,448
LHMWD	7	4,240
Soboba Tribe	4	770
Private Pumpers	10	1,033
Total	**24**	**9,491**

[2] Mann-Kendell analysis is a data trend analysis tool to determine if the values of a variable generally increase or decrease over a period of time in statistical terms (Helsel & Hirsch, 1992). Parametric or non-parametric statistical tests can be used to decide whether there is a statistically significant trend.

3.3 Groundwater Elevation

Groundwater elevations within Canyon Sub-Basin respond rapidly to changing hydrologic conditions in the basin. Trend analysis over the 1984 – 2013 time period was performed for 30 wells with sufficient groundwater elevation data using the Mann-Kendall test, with results presented Table 3-3. Eleven wells displayed a negative trend, all of which were EMWD or LHMWD wells. Thirteen wells exhibited no trend, and six wells showed an increasing trend. The Soboba and private pumper wells typically had no trends in water elevation data or recorded an increase in elevations. In general, these wells had shorter historical periods and may not capture the full hydrologic conditions for 1984 – 2013.

Hydrographs are presented in Figure 3-14 and Figure 3-15, which generally show groundwater levels decreasing from 1987 to 1992, when California was experiencing a drought, followed by a recovery back to near the elevations prior to the drought period. However, many wells show groundwater elevations declining again with the next dry period, starting around 1999.

Table 3-3: Groundwater Elevation Trends in Canyon Sub-Basin Wells, 1984 - 2013

Decreasing Elevations	No Trend	Increasing Elevations
EMWD 05 Cienega	EMWD 07 Cienega	EMWD 34 Cienega
EMWD 06 Cienega	EMWD 17 Cienega	LHMWD 15
EMWD 08 Cienega	LHMWD 01	Soboba DW 03
EMWD 26 Cienega	LHMWD 01A	Soboba DW 04
LHMWD 02	LHMWD Georgiana	McMillan Acacia
LHMWD 03	Soboba DW 01	Washburn Pepper Tree
LHMWD 04	Soboba IW 02	
LHMWD 05	Fruitvale MWC	
LHMWD 06	Howard, G. S.	
LHMWD 10	Lindquist, R.	
LHMWD 14	Lypps	
	McMillan Bee Canyon	
	Washburn Grant/Florida	

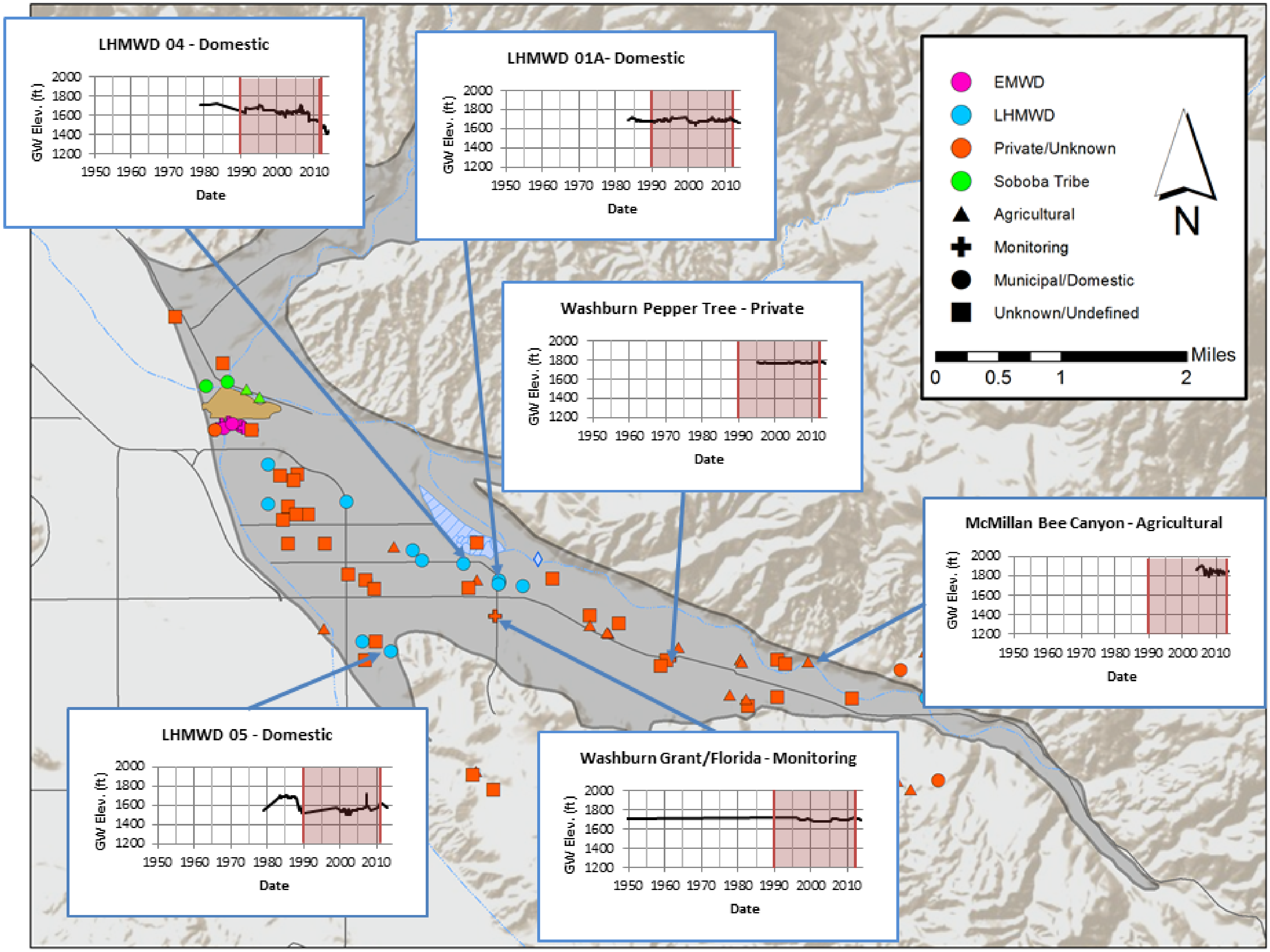


Figure 3-14: Hydrographs for Select Wells in the Canyon Sub-Basin (1 of 2)

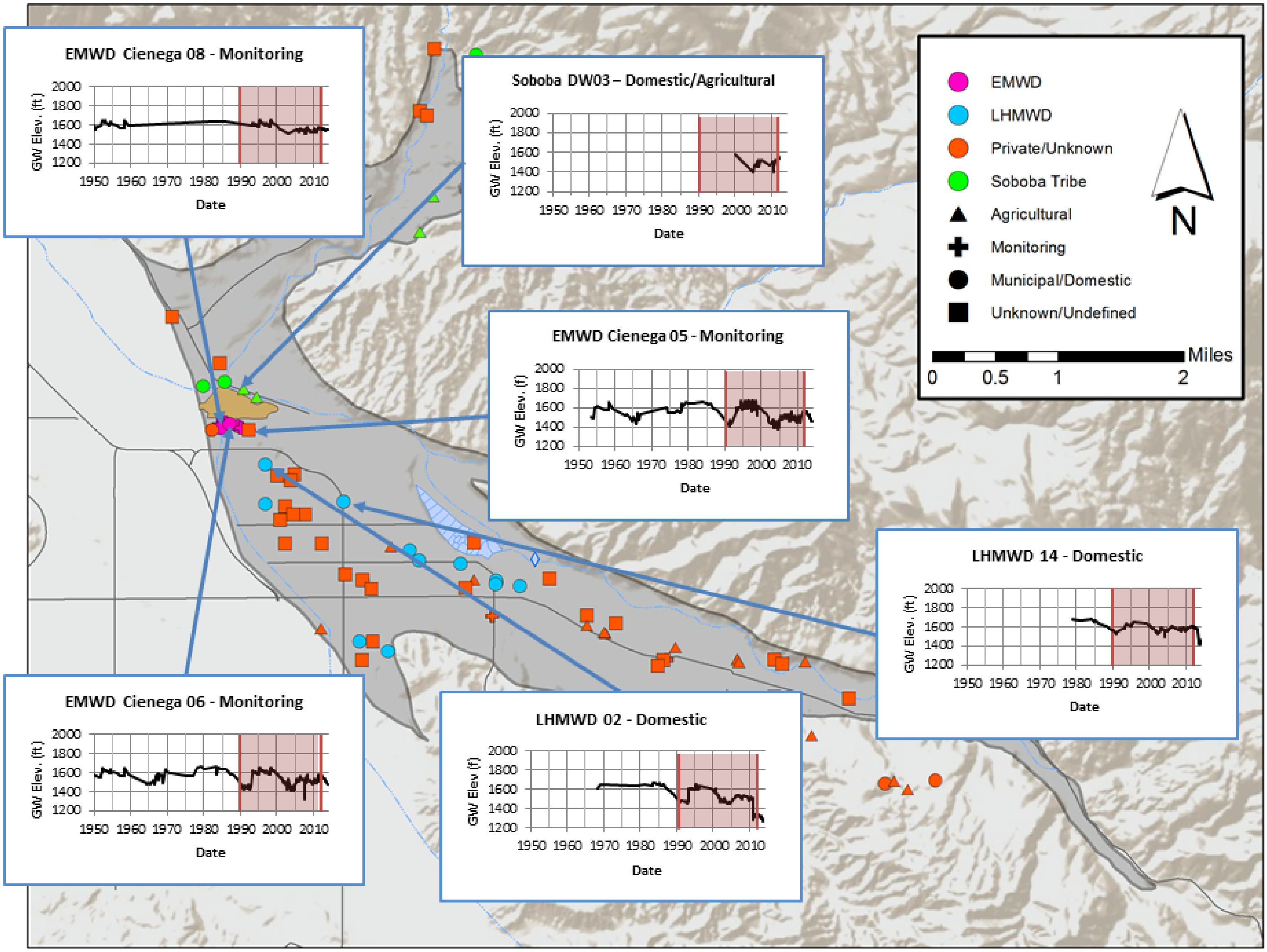


Figure 3-15: Hydrographs for Select Wells in the Canyon Sub-Basin (2 of 2)

3.4 Groundwater Quality

While groundwater quality in the Canyon Sub-Basin is generally of very high quality, there are areas of groundwater quality concerns. Maintaining the high quality of groundwater limits the sources of water for artificial recharge. The primary constituents of concern in the Canyon Sub-Basin are total dissolved solids (TDS) and nitrate. Groundwater quality is impacted at times in a few wells by these constituents, exceeding thresholds set by the Division of Drinking Water Program at the State Water Resources Control Board (State Water Board), formerly part of the California Department of Public Health (CDPH).

Note that values presented in this section are for raw water and are not necessarily indicative of delivered water quality. Additionally, a single detection of a contaminant may not indicate contamination, and the State Water Board would not consider a single detection of a contaminant, if unconfirmed with a follow-up detection, to be an actual finding. Finally, raw water may be treated or blended prior to delivery, or may not be used for drinking water supply purposes. Water quality information is presented here to summarize aquifer conditions for the 1984 – 2012 period; information on delivered water quality can be obtained from EMWD or LHMWD through their annual Water Quality Reports.

3.4.1.1 Total Dissolved Solids (TDS)

California’s secondary maximum contaminant level (SMCL) for TDS is divided into three different levels:

- Recommended Level: 500 milligrams per liter (mg/L)
- Upper Level: 1,000 mg/L
- Short Term Use Level: 1,500 mg/L

SMCLs address esthetics such as taste and odor, and do not necessarily indicate health concerns at concentrations above the threshold.

EMWD, LHWMD, and Soboba Tribe wells have good groundwater quality in regards to TDS, with only one instance with a sampled concentration greater than the 500 mg/L Recommended SMCL during the 1984 – 2012 period. No wells showed concentrations above the Upper SMCL of 1,000 mg/l. Private wells have had the highest TDS concentrations in the basin, especially the Washburn Pepper Tree well, which has consistently reported concentrations of 500 mg/L or more, which is above the Recommended SMCL, but below the Upper SMCL. Historical TDS concentrations in the basin can be found in Figure 3-16.

3.4.1.2 Nitrate

The State Water Board has set a primary drinking water maximum contaminant level (MCL) for nitrate (as NO_3) at 45 mg/L for public water systems. MCLs are health protective drinking water standards to be met by public water systems. MCLs take into account not only chemicals' health risks but also factors such as their detectability and treatability, as well as costs of treatment (CDPH, 2014) .

Three of 28 wells with data have at least one measurement above the MCL during the 1984 – 2012 period. The only wells with consistently elevated nitrate concentrations are private wells. The Washburn Grant/Florida well has recorded nitrate concentrations ranging from 47 to 68 mg/L and averaged over 50 mg/L during this time. Figure 3-17 shows the historical nitrate concentrations for each well owner.

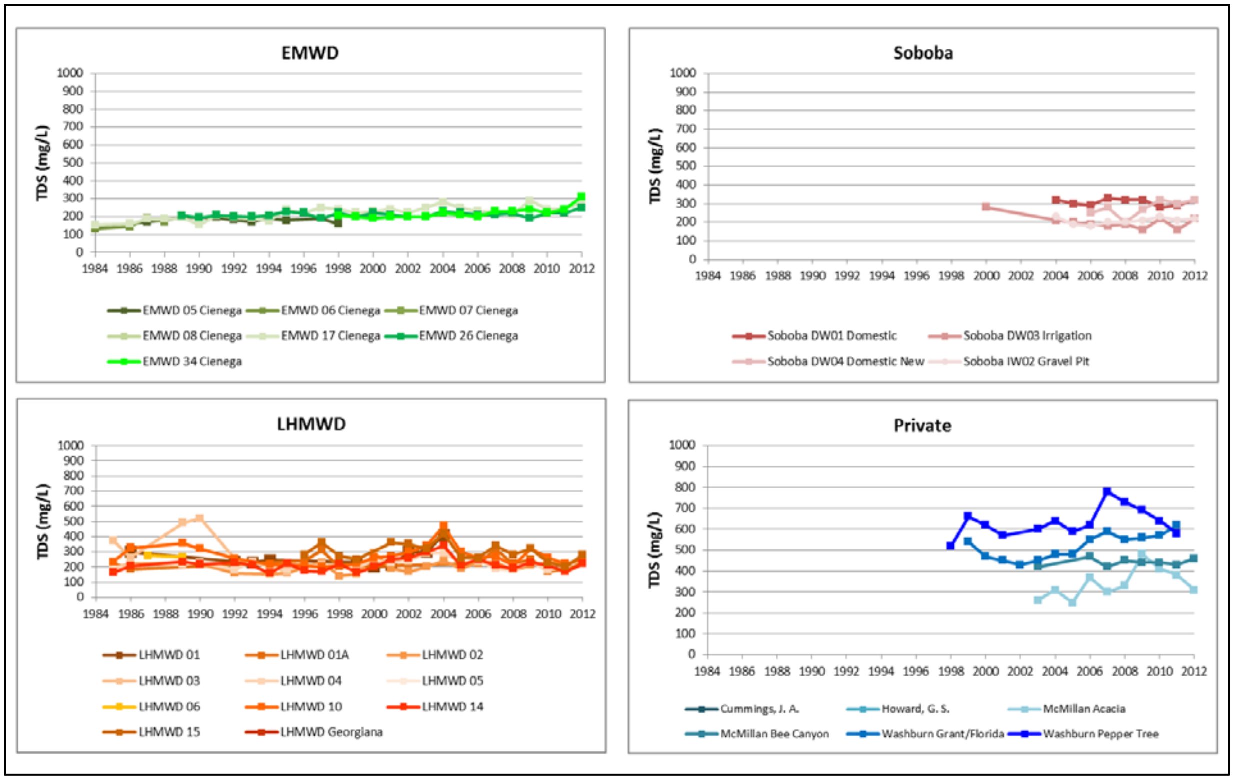


Figure 3-16: Historical TDS Concentrations

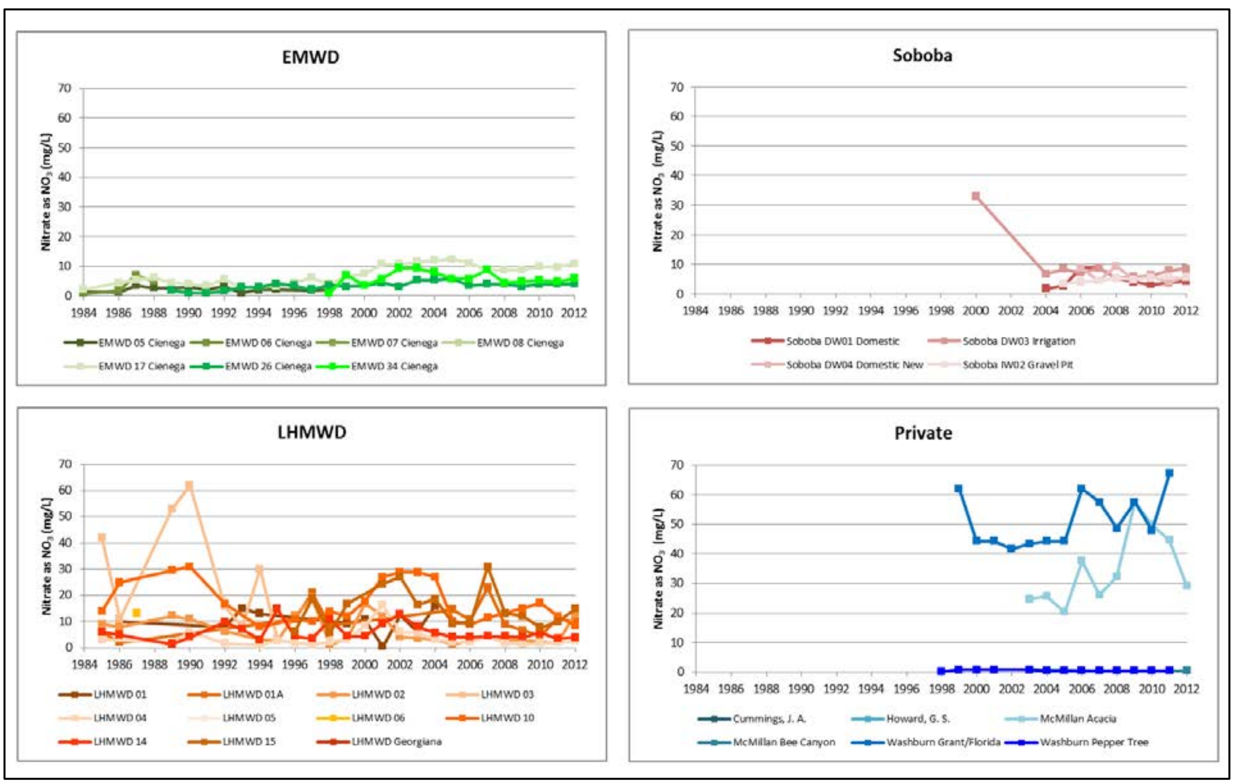


Figure 3-17: Historical Nitrate Concentrations

Section 4 Planning Storage Estimates

Planning Storage estimates were developed to relate groundwater elevations in the Canyon Sub-Basin to overall Planning Storage. Planning Storage refers to the estimate of groundwater in storage in the portion of the Canyon Sub-Basin aquifer that is readily accessible to groundwater wells. As the Planning Storage does not represent total groundwater in storage, the values are relevant only to this Plan and are not necessarily applicable to other storage studies.

4.1 Planning Time Period

A time period of 1990 – 2012 was selected for the analyses in this Plan, including the estimate of Planning Yield and the development of Planning Storage estimates. The 1990 – 2012 time period was selected based on three criteria: high quality data, reflective of long-term hydrologic conditions, and reflective of existing basin conditions. Data quantity and quality were generally higher in more recent years as data collection efforts have increased. Also, basin conditions were more similar to today in more recent years due to changes in land uses. Thus, the analysis to identify a period that was reflective of long-term hydrologic conditions focused on the more recent time period.

Identification of a period indicative of long-term hydrologic conditions was performed through analysis of long-term precipitation records for the Canyon Sub-Basin area. Figure 4-1 shows the annual precipitation and cumulative departure from mean precipitation at RCFCWCD's San Jacinto gauge (#186). This gauge was selected for analysis of historical hydrology as it had a longer and more complete period of record than other nearby gauges. The average precipitation at San Jacinto over the 1911 – 2013 time period was 12.8 inches per year. Individual dry years and wet years can be easily seen as plotting below or above the average annual precipitation, respectively. Long-term trends are best seen through the cumulative departure from mean precipitation. The cumulative departure line adds the difference between a year's precipitation and the average precipitation to the sum of the prior years' differences. In this way, the cumulative departure displays wet periods with upwards slopes and dry periods with downwards slopes. Figure 4-1 shows:

- Wet periods: 1911 – 1916, 1937 – 1945, 1978 – 1983, 1991 – 1998
- Normal periods: 1917 – 1936
- Dry periods: 1946 – 1977, 1984 – 1990, 1999 – 2013

The time period was selected to be representative of long-term normal conditions. This would be presented in the cumulative departure from mean precipitation line as a period where the starting cumulative precipitation and ending cumulative precipitation are similar. The time period may include wet, dry, and normal periods which, when taken together, provide average annual precipitation near the long-term (1911 – 2013) average. 1990 – 2012 is such a time period and was selected, with an average annual precipitation the same as the long-term average: 12.8 inches per year.

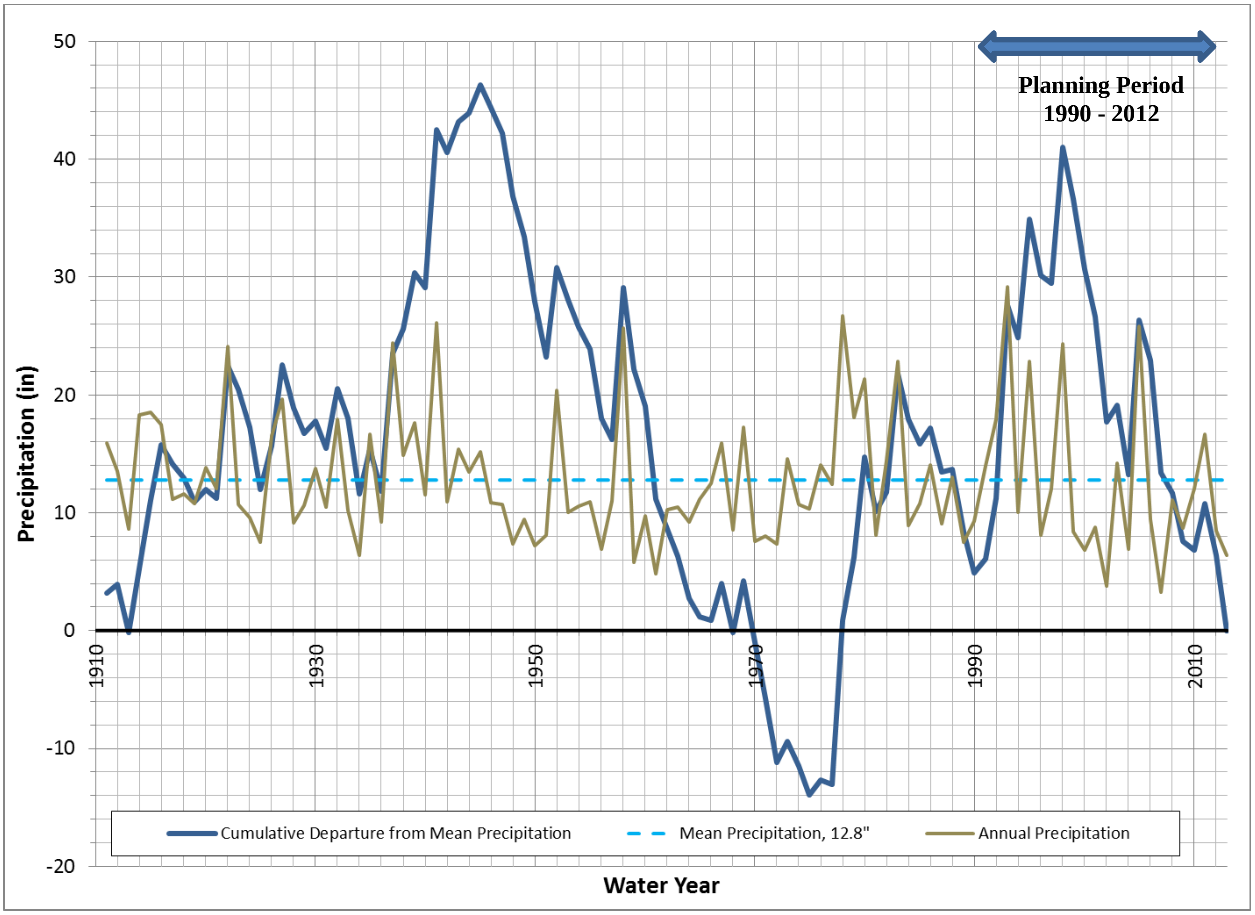


Figure 4-1: Annual Precipitation, San Jacinto

4.2 Methodology

The development of the Planning Storage estimates included defining the extent of the basin for planning purposes, developing contours, estimating specific yield, and calculating the estimate of Planning Storage for each spring from 1990 – 2012, as well as for hypothetical dry years.

Storage estimates were developed for the portion of the basin that generally contains groundwater elevation data and that is generally used for water supply. Not included in the estimates were areas up Poppet Creek, Indian Creek, and the upper portions of the San Jacinto River (upstream of well data). These areas were included in the storage estimate through a constant value (19,500 AF) developed based on uniform depth-to-water extending up each arm of the basin. Also not included in the estimate was the portion of the aquifer deeper than the water supply wells. The total depth of the aquifer was not known and thus this value could not be estimated. As several components of total basin storage were not included in the estimates, this value is termed “Planning Storage” and is not an estimate of overall groundwater in storage in the basin.

Contours were developed to define the upper surface of the aquifer. The contours were based on available existing contour maps and historical groundwater elevation data. Contour maps developed by EMWD for each year from 2007 – 2012 were reviewed and updated to include additional groundwater elevation data provided by the Soboba Tribe. For the years prior to 2007, with no existing contour maps available, new contours were developed based on existing historical groundwater elevation data. Contour maps were developed to be as consistent as possible with the historical data and the contour maps for the previous and subsequent years. This methodology was intended to allow for consistent estimates across years, even though there was variability in data available from year to year.

Contour maps were also developed for hypothetical low groundwater elevation conditions to develop information for groundwater conditions that were lower than what had been experienced during the 1990 – 2012 time period. Contours from the year with the lowest groundwater elevations (1991) were adjusted downward. The adjustment was developed based on four potential critical groundwater elevations at Soboba Tribe wells. The exact groundwater elevations were not critical for this purpose, as these values were used to develop storage curves rather than individual data points. Near the Soboba wells, the contoured levels were reduced to the lower groundwater elevation. Farther from the wells, the contours were reduced by the same amount, but multiplied by an adjustment factor that relates how groundwater levels had historically declined. The adjustment factor was a ratio of wet period groundwater elevations (1996) to dry year groundwater elevations (1991), and allowed for greater reductions in groundwater elevations in the Cienega area compared to the rest of the basin (Figure 4-2). This is consistent with historical conditions as the Cienega area has both focused production and focused recharge, resulting in higher variability in groundwater elevations.

The volume of saturated aquifer, again, for the portion of the basin that generally contains groundwater elevation data and that is generally used for water supply, was then calculated. The calculations were performed using the grid and basin geometry defined in the Soboba Tribe groundwater model (Aspect Consulting, 2008). For each model grid cell, the area of the cell was multiplied by the difference between the contour elevation and the elevation of the bottom of the model. The values for each cell were added to estimate the volume of saturated aquifer.

Specific yield is the amount of water that can drain freely from a unit volume of aquifer. This value is used to estimate the amount of groundwater in storage based on the volume of saturated aquifer. A value of 0.15 was used for specific yield, which is consistent with previous estimates for the EMWD groundwater model (0.15) and the Soboba Tribe groundwater model (0.12 – 0.16). An estimate of Planning Storage was developed for each year by multiplying the saturated aquifer volume by the specific yield estimate.

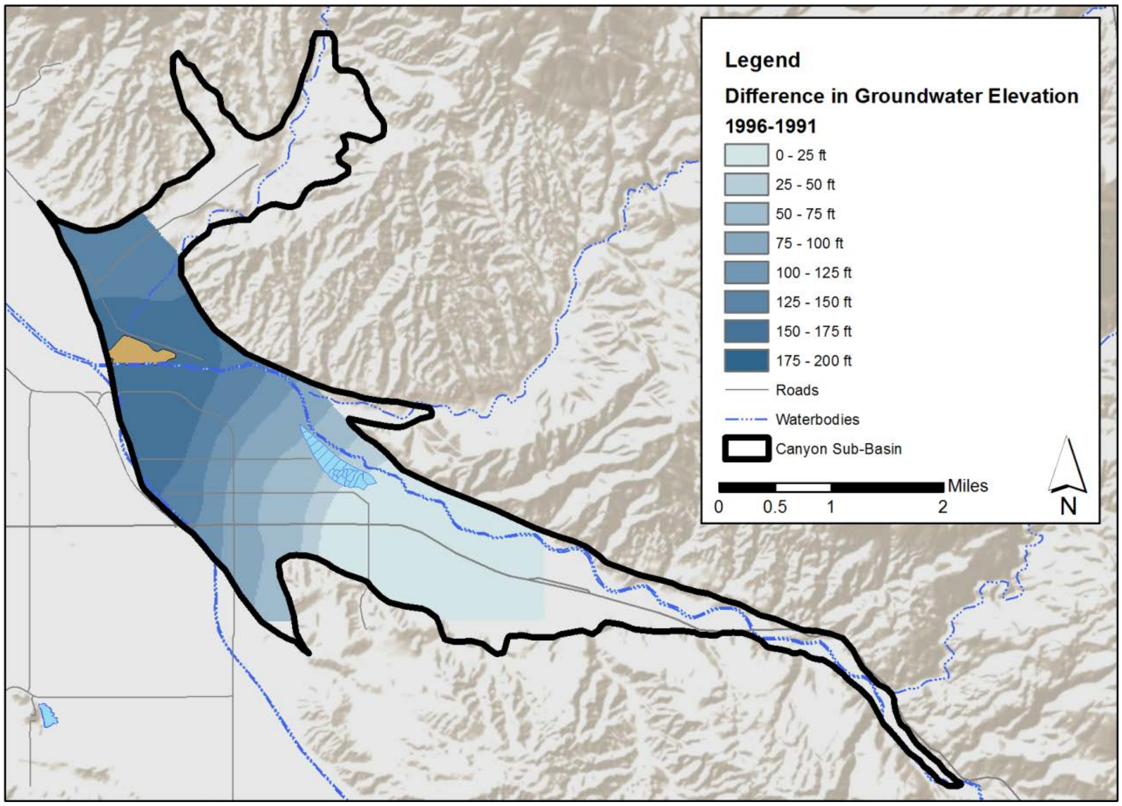


Figure 4-2: Difference in Groundwater Elevations, 1996 – 1991

4.3 Results

Planning Storage estimates were developed for each spring from 1990 – 2012 and for hypothetical low groundwater level conditions. The annual Planning Storage estimates are shown in Figure 4-3. These values were used to develop Planning Storage Curves to relate Key Well groundwater levels to Planning Storage estimates (see Section 6.2) and to relate critical groundwater levels to storage-based trigger levels (see Section 6.3).

The estimates showed that, during the 1990 – 2012 time period, historical Planning Storage varied from a low of 201,000 AF to a high of 236,000 AF, representing a range of 35,000 AF.

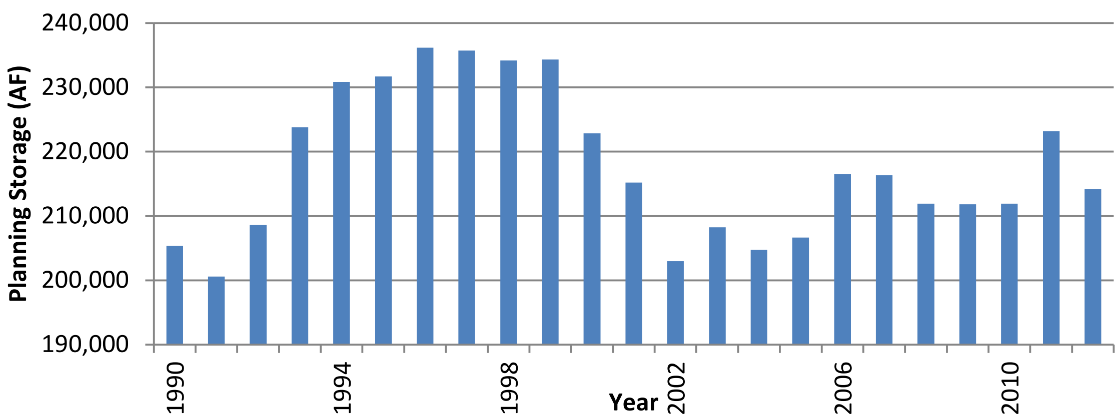


Figure 4-3: Estimates of Historical Planning Storage

Section 5 Planning Yield Estimate

Planning Yield was developed for the sole purpose of managing groundwater in the Canyon Sub-Basin through this Plan. While the Planning Yield has its basis in the concepts of Safe Yield and Sustainable Yield, it was not intended to meet the broader needs of those terms. Planning Yield was defined by the Plan participants as:

> *A planning-level value representing the long term, average quantity of water supply in the Canyon Sub-Basin that can be produced without causing undesirable results, including the gradual reduction of natural groundwater in storage over long-term hydrologic cycles.*

The methodology and results are provided in the following sections.

5.1 Methodology

Based on the definition above, Planning Yield was estimated through a water balance over a long-term, recent, hydrologically-balanced period (See Section 4.1). For each year, an annual estimate of Planning Yield was developed by adding the estimated change in groundwater in storage for that year to that year's estimated groundwater production. These annual estimates were averaged over the 23-year hydrologic sequence (1990 – 2012) to develop the estimate of Planning Yield, as shown in Equation 1, below.

$$Planning\ Yield = \frac{\sum_{i=1990}^{2012}(Change\ in\ Groundwater\ in\ Storage_i + Groundwater\ Production_i)}{23} \qquad [1]$$

Not included in the change in storage was the artificial recharge of imported water, as this is a management decision which may or may not occur in the future.

5.1.1 Change in Storage

Change in groundwater in storage was estimated through a water balance. The water balance approach estimated inflows and outflows from the basin and then subtracted those values to estimate the change in storage. This method also allowed for a better understanding of the relative importance of inflow and outflow components which helps support management efforts.

The water balance approach to estimation of change in groundwater in storage contained numerous components. These components are listed below and shown graphically in Figure 5-1. Data sources and assumptions for each item are provided in the following subsections.

- Inflows
  - Precipitation Recharge
  - San Jacinto River Recharge
  - San Jacinto River Tributaries Recharge
  - Artificial Recharge (only water of local origin from the San Jacinto River, which occurs at Grant Avenue Ponds, was included in the analysis)
  - Agricultural Applied Water Recharge, including areas served by LHMWD and the Soboba Tribe
  - Municipal and Industrial (M&I) Use Recharge, including sewered areas served by LHMWD and areas with onsite wastewater treatment systems (OWTS or septic tanks) served by LHMWD and the Soboba Tribe
- Outflows
  - Groundwater Production
  - Subsurface Flow between Canyon and Upper Pressure

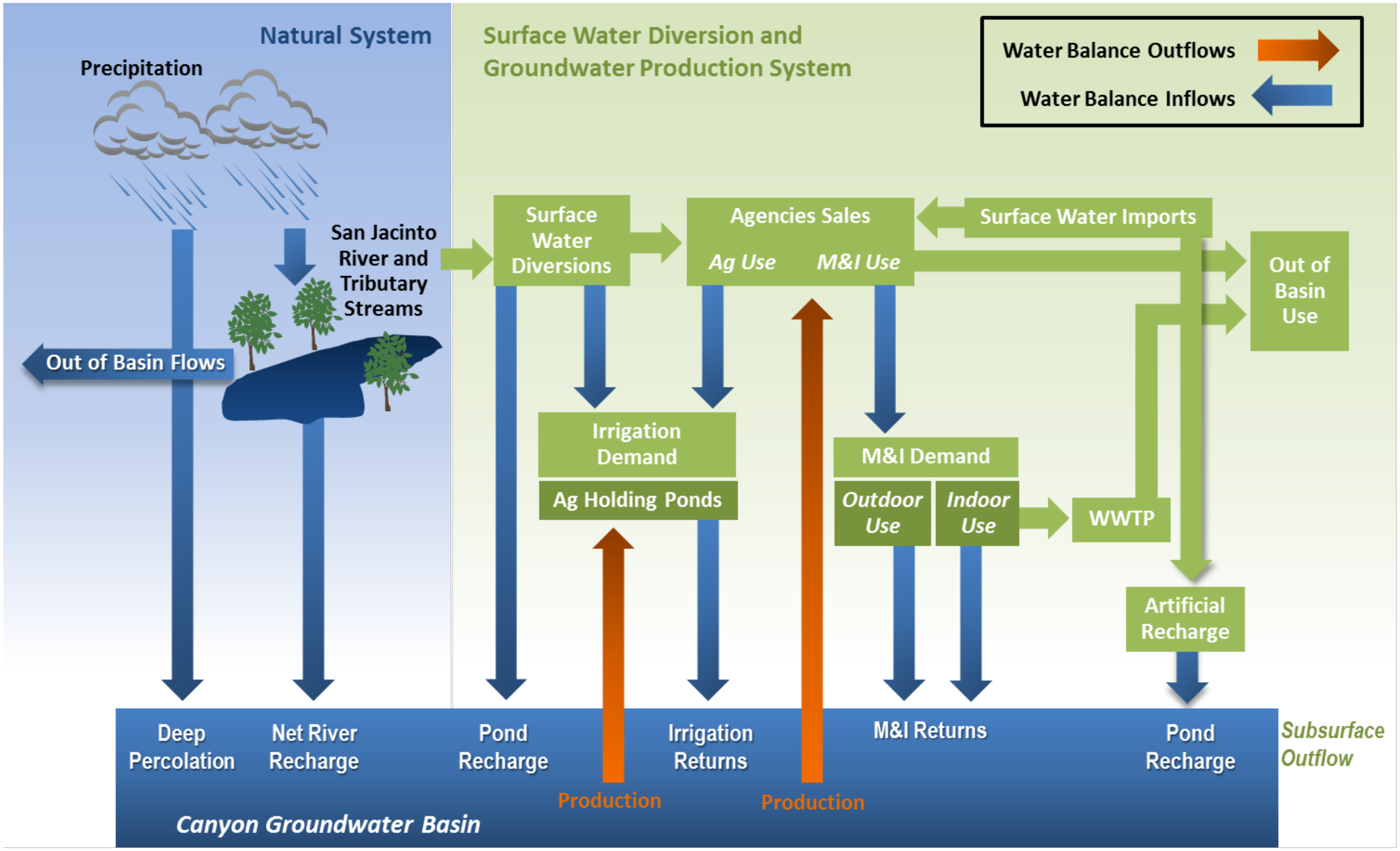


Figure 5-1: Schematic Water Balance for the Canyon Sub-Basin

A second method, analyzing the change in groundwater elevation, was also developed in coordination with the Storage Curve development (Section 4) and was used as a verification for the water balance-based estimate. Figure 5-2 compares the two estimates of storage and also compares to groundwater elevations in the Canyon Sub-Basin. The figure highlights groundwater elevations from Cienega-area wells and shows close correlation between the two methods and with groundwater elevation trends. The storage estimates also matched well with other groundwater elevations in the basin after adjusting for magnitude differences.

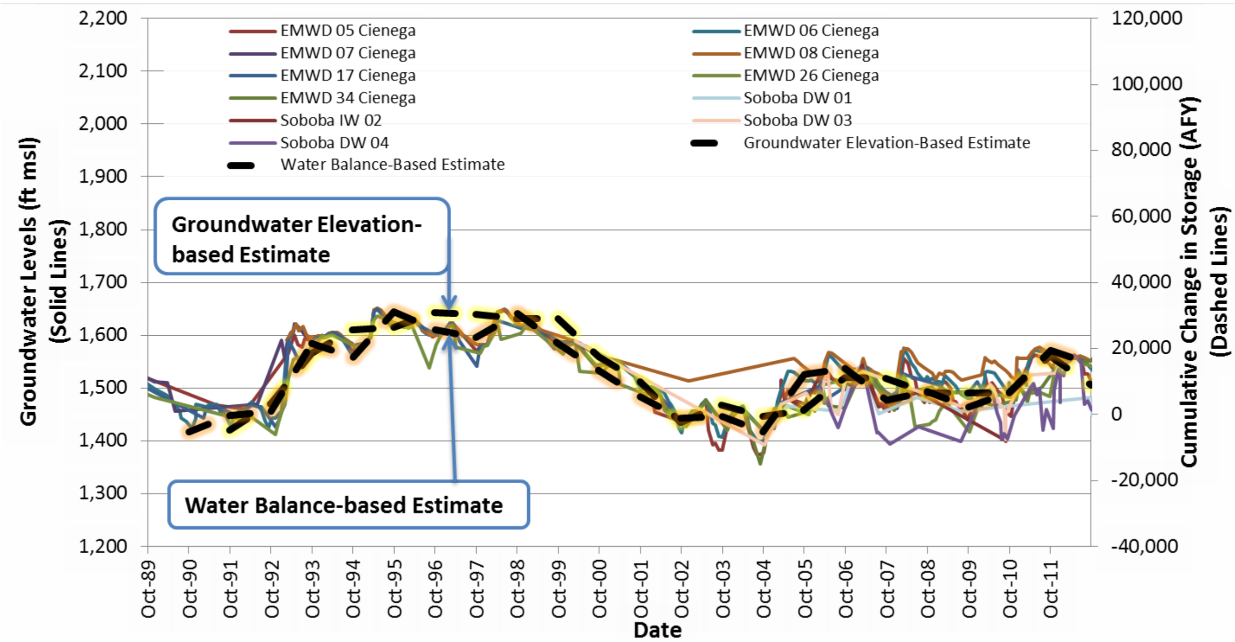


Figure 5-2: Quality Control Comparison of Cumulative Change in Storage Estimates Using Planning Yield and Planning Storage Methodologies, and Groundwater Elevation at Cienega-Area Wells

5.1.2 Inflows

5.1.2.1 Precipitation Recharge

Estimates of recharge from deep percolation of precipitation were developed using information from Guay (2002). That report contains estimates of infiltration from precipitation reported for three areas that cover the Canyon Sub-Basin area (see Figure 5-3). Estimates were scaled to reflect the proportion of recharge that would occur only within the Canyon Sub-Basin. This scaling was performed separately for each area and was based on the percentage of land surface with a slope of less than 10% (see Figure 5-4). The 10% assumption was based on focusing infiltration on the relatively flat valley floor where runoff will be generally slower and soils are generally deeper. Based on this analysis, the following proportions of recharge from the three areas were included in the estimate of recharge from precipitation for the Canyon Sub-Basin.

- Area 1: 30%
- Area 2: 58%
- Area 3: 33%

These percentages resulted in an annual average recharge from precipitation of 270 AFY, with annual values varying from a high of 1,300 AFY (1993) to a low of 20 AFY (1990). The low levels of recharge from precipitation indicated that a majority of the precipitation runs off to surface water courses, evaporates, or is transpired by plants, which is consistent with the semi-arid environment.

Estimates from Guay covered the 1950 – 1998 time period on a monthly basis. Estimates of monthly recharge from precipitation for 1999 – 2012 were derived from a linear least squares regression of monthly recharge from precipitation on precipitation at RCFCWCD's San Jacinto gauge, streamflow at the USGS Cranston Gauge, the square of precipitation at RCFCWCD's San Jacinto gauge, and the square of streamflow at the USGS Cranston Gauge for the period of 1951 to 1991. The relationship between the Guay-based monthly precipitation recharge estimate and the regression-based monthly precipitation recharge estimate is shown in Figure 5-5.

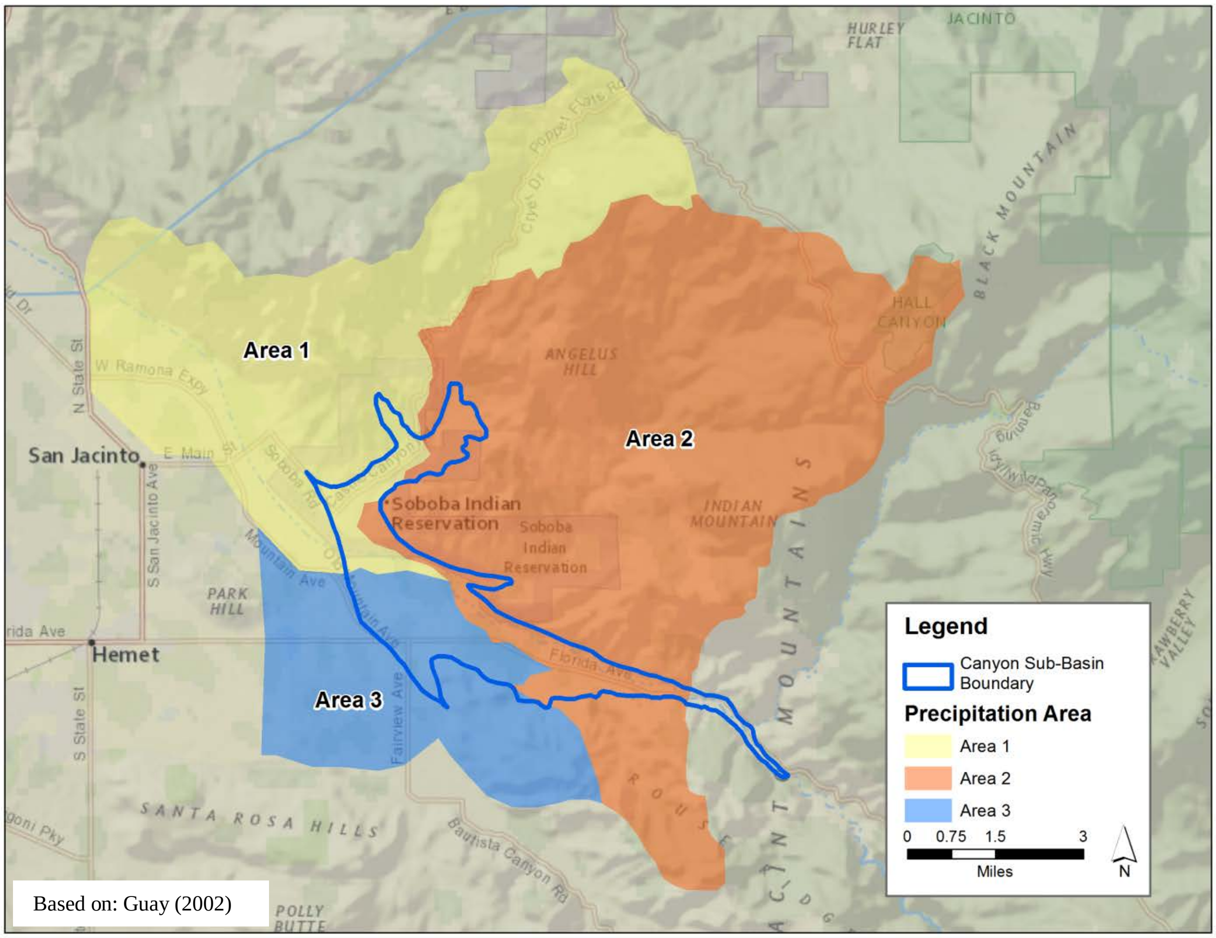


Figure 5-3: Guay (2002) Precipitation Areas Overlaying the Canyon Sub-Basin

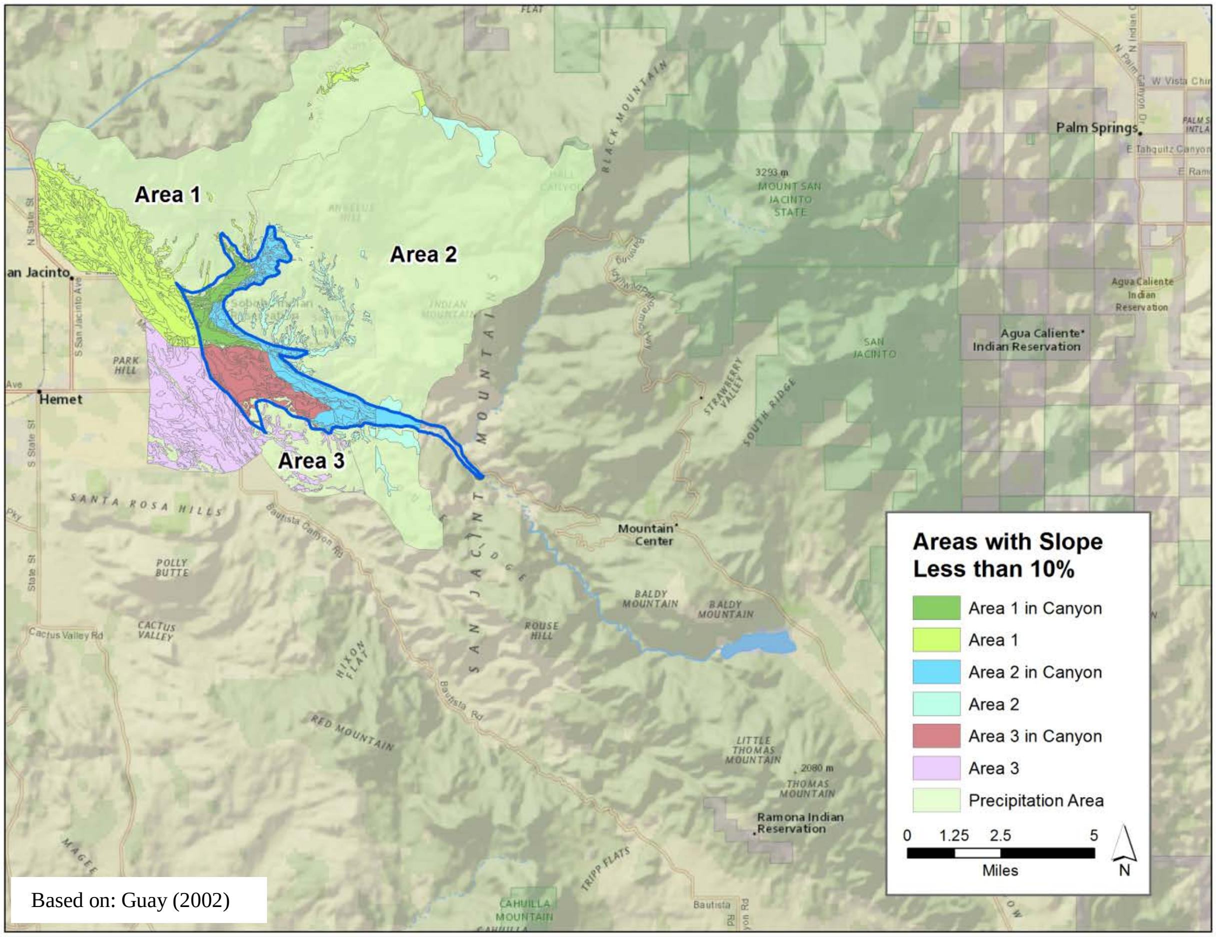


Figure 5-4: Land Surfaces with Slopes Less than Ten Percent

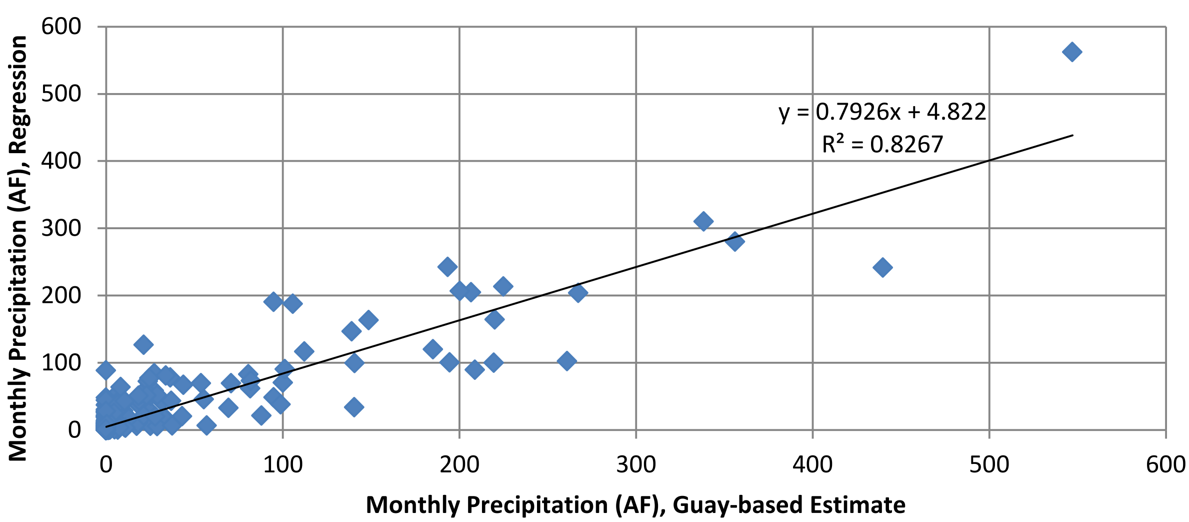


Figure 5-5: Relationship between Guay-based Monthly Precipitation Recharge and Regression-Based Monthly Precipitation Recharge Estimate

5.1.2.2 San Jacinto River Recharge

Estimates of recharge from the San Jacinto River were developed using information from Guay (2002). That report contains estimates of infiltration from the San Jacinto River reported for five reaches, two of which cover the Canyon Sub-Basin area. Reach 2 is wholly within the Canyon Sub-Basin, while 28% of Reach 5 is within the sub-basin.

Estimates from Guay covered the 1950 – 1998 time period on a monthly basis. Estimates of monthly recharge from the San Jacinto River for 1999 – 2012 were derived from a linear least squares regression of recharge from the San Jacinto River on precipitation at RCFCWCD's San Jacinto gauge, streamflow at the USGS Cranston Gauge, the square of precipitation at RCFCWCD's San Jacinto gauge, and the square of streamflow at the USGS Cranston Gauge. The relationship between the Guay-based monthly San Jacinto River recharge estimate and the regression-based monthly San Jacinto River recharge estimate is shown in Figure 5-6.

75% of channel infiltration was assumed to recharge the basin. The reduced amount was based on calibration with more recent data developed by Aspect Consulting (2014) and as consistent with the previous groundwater model calibration (TechLink Environmental, 2002) which required reduction of the channel recharge volume. Grant Avenue Ponds diversions were removed from the recharge volume estimate to avoid double counting, as these diversions occur below the Cranston Gauge.

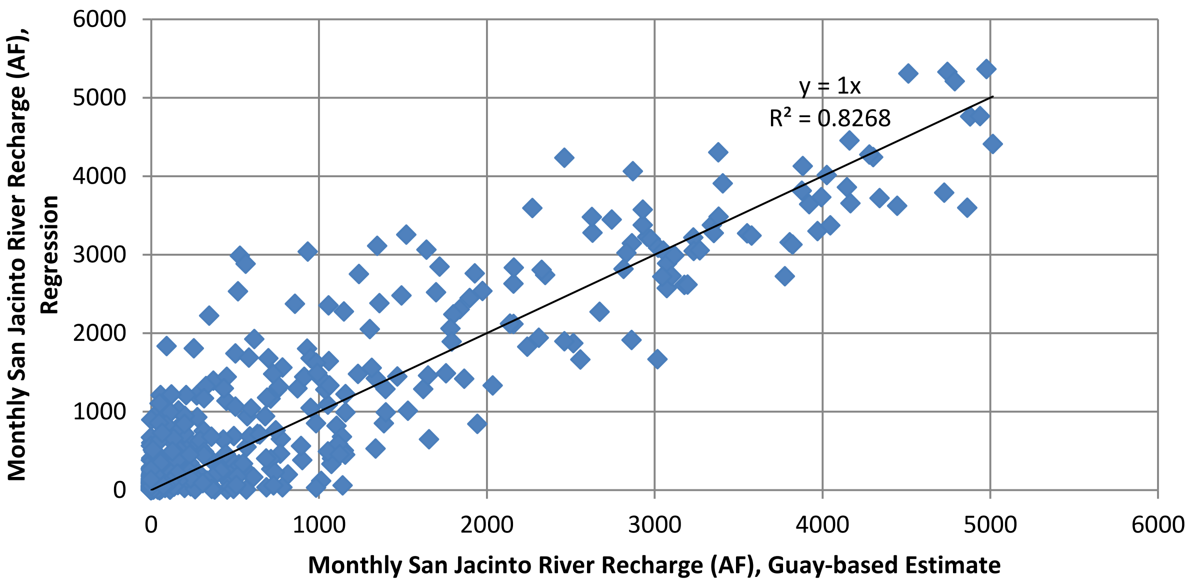
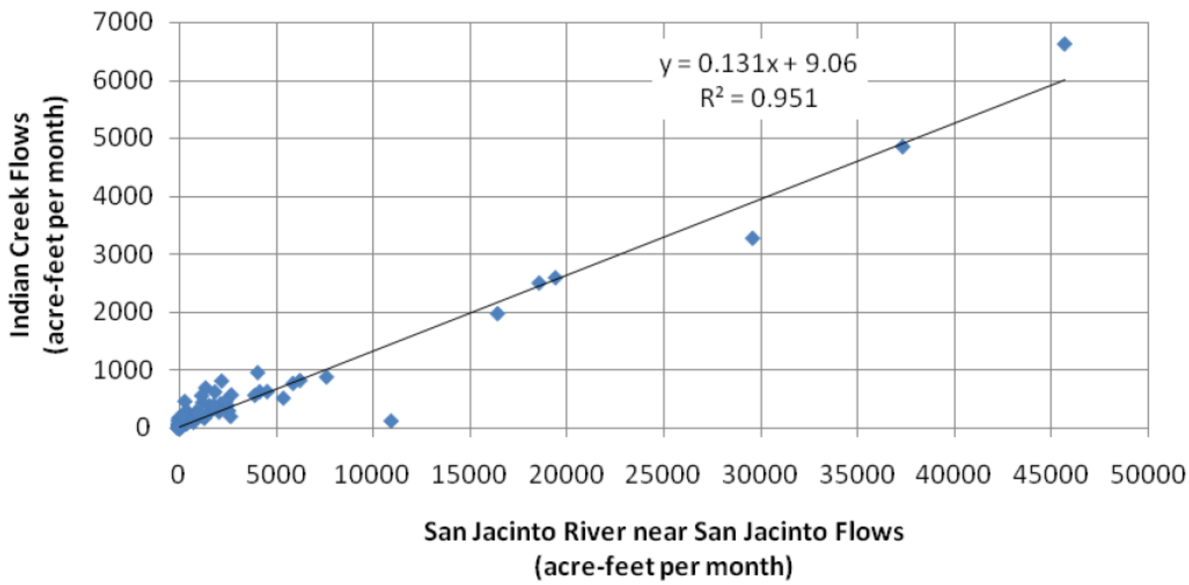


Figure 5-6: Relationship between Guay-based Monthly San Jacinto River Recharge and Regression-Based Monthly San Jacinto River Recharge Estimate

5.1.2.3 San Jacinto River Tributaries Recharge

Little data were available for flow on the San Jacinto River tributaries within the Canyon Sub-Basin. Indian Creek and Poppet Creek are the primary tributaries. Estimates of flow for Indian Creek were based on a correlation between San Jacinto River flow and Indian Creek flow (see Figure 5-7) developed by Aspect Consulting (2014). Correlation between the San Jacinto River recharge estimates was used to fill data gaps caused by the incomplete data record for the Cranston Gauge. Flow estimates for Poppet Creek were estimated as 45% of the Indian Creek flow, based on previous analysis by Schwartz (1967).

Low flows from Indian Creek and Poppet Creek were assumed to generally recharge the aquifer. However, periods of high flows were likely to result in outflow from the basin. An analysis of Indian Creek estimated streamflow and State Street measured streamflow (downstream of the Canyon Sub-Basin) indicated that outflow conditions exists generally when Indian Creek streamflow is greater than 800 AF/month (see Figure 5-8). Thus, the first 800 AF/month of Indian Creek flow were assumed to recharge the aquifer, with flows above that level assumed to leave the basin as surface water flows. Similarly, the first 360 AF/month of Poppet Creek flow (45% of the 800 AF/month on Indian Creek) were assumed to recharge the aquifer, with flows above that level assumed to leave the basin as surface water flows.



Source: Aspect Consulting 2014

Figure 5-7: Relationship between Streamflow on the San Jacinto River and in Indian Creek

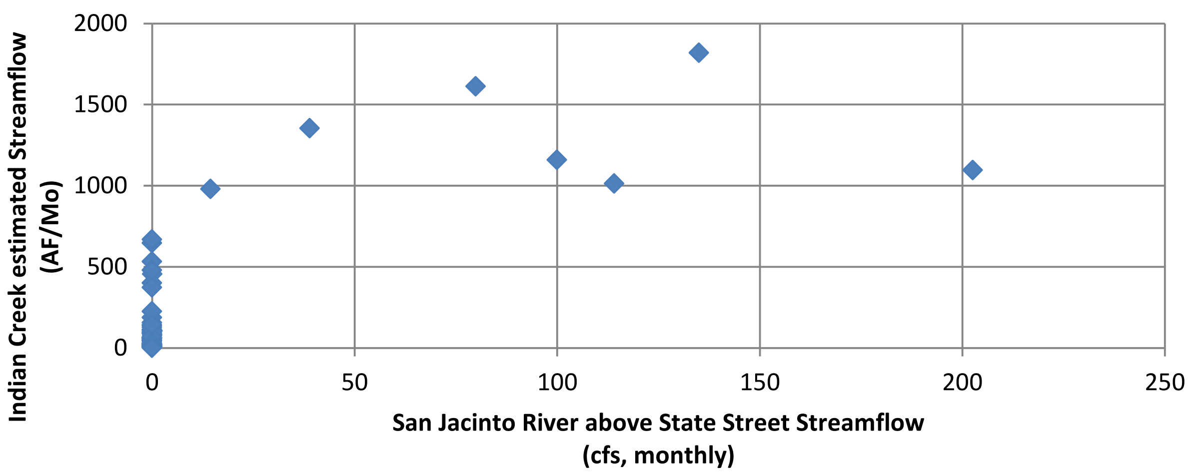


Figure 5-8: Relationship between Streamflow in the San Jacinto River above State Street and in Indian Creek

5.1.2.4 Agricultural Applied Water Recharge

Agricultural water use was assumed to result in 15% of applied water recharging the aquifer. The estimate of 15% was based on previous analysis of drip and micro-spray irrigation on citrus crops in the Temecula Valley (Rancho California Water District, 2014). The study included estimates of crop evapotranspiration, leaching fractions, and irrigation efficiency.

5.1.2.5 Domestic Use Recharge

Domestic use included assumptions on the percent sewered, percent of outdoor use, and the percent of water that recharges the aquifer.

Domestic use within the Soboba Tribe was assumed to be served by OWTS. LHMWD's service area is partially sewered, with 75% assumed to be served by a sewer based on the ratio of sewered to total parcels within Canyon Sub-Basin. Sewered parcels were assumed to have no recharge to groundwater from indoor use. Parcels served by OWTS were assumed to have 90% of indoor use recharged to groundwater with the remaining 10% lost to plants through transpiration.

Outdoor use was assumed to be 60% (Santa Ana Watershed Project Authority, 2012). 25% of outdoor use is assumed to recharge the aquifer, based on previous analysis of turfgrass irrigation in the Temecula Valley (Rancho California Water District, 2014).

5.1.2.6 Artificial Recharge

Data from historical artificial recharge at the Grant Avenue Ponds of diverted San Jacinto River flow and imported water were included for historical comparisons. Recharge of imported water was not included in the final estimation of Planning Yield as such artificial recharge may or may not occur in the future.

5.1.3 Outflows

5.1.3.1 Groundwater Production

Historical groundwater production data from the Regional Water Resources Database (RWRD), which is maintained by EMWD, were utilized to represent groundwater production in the Canyon Sub-Basin. Groundwater production data from the RWRD included municipal and agricultural production by EMWD, LHMWD, the Soboba Tribe, and private groundwater producers. Data were provided by the well owners as part of the adjudication process or through private reporting to the State Water Resources Control Board in compliance with Water Code Sections 4999 et seq., which requires filing, with few exceptions, by persons who extract more than 25 AF of groundwater from wells in Riverside, San Bernardino, Los Angeles, or Ventura Counties. Such reporting is performed through the local cooperating agency, which in this case is EMWD.

5.1.3.2 Subsurface Flow

Subsurface flow was limited as the Claremont Fault forms a significant barrier to flow until groundwater levels reach approximately 60 feet below grade. Flow was assumed to occur across the Claremont Fault only when groundwater is within 40 to 60 feet of the surface. Such conditions have historically occurred during wet periods when the Canyon Sub-Basin is fully saturated. The volume of water was estimated based on cross sectional area with groundwater elevations above the 60-foot threshold, gradient across the fault developed using groundwater level data, and an estimate of hydraulic conductivity.

5.2 Planning Yield Estimate Results

Based on the above data, assumptions, and analysis, the Planning Yield was estimated to be 10,100 AFY. Table 5-1 provides details on the components of the Planning Yield, which are shown graphically as inflows and outflows in Figure 5-9. Figure 5-10 shows the annual variability within the Planning Yield, which is an estimate based on the 1990 - 2012 long-term average, and Figure 5-11 compares the Planning Yield estimate to historical groundwater production in the Canyon Sub-Basin.

Table 5-1: Planning Yield Components

Item	Notes	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average
		Water Year																							
Inflow																									
Precipitation	1	18	345	60	1,348	34	929	99	314	767	37	60	55	29	154	181	616	144	44	208	84	481	234	46	**273**
San Jacinto River	2	1,903	7,787	6,772	16,701	3,605	13,341	5,041	9,417	14,177	1,609	1,552	1,240	47	5,628	1,834	12,949	7,565	45	5,310	1,440	5,424	11,738	2,014	**5,963**
Tributaries	3	216	2,112	1,283	6,999	337	6,220	1,701	1,407	6,550	396	398	353	165	1,162	445	5,630	1,873	164	2,032	670	1,932	4,233	478	**2,033**
Agricultural Use	4																								
LHMWD		381	287	265	412	412	375	421	454	345	428	449	424	436	367	355	335	398	466	424	415	371	389	444	**394**
Soboba Tribe		60	60	60	60	12	37	81	70	60	69	65	58	93	33	53	43	58	63	71	74	63	52	60	**59**
Domestic Use																									
LHMWD, Sewered	5	143	145	150	152	150	141	164	179	152	176	198	192	215	212	232	202	212	223	198	191	177	168	177	**180**
LHMWD, OWTS	5	162	165	170	172	170	159	186	203	173	199	225	218	244	240	263	228	240	253	224	216	200	190	201	**204**
Soboba Tribe, OWTS	6	17	17	17	17	69	90	101	110	90	88	123	145	140	103	213	205	112	125	87	89	93	82	89	**97**
Artificial Recharge																									
Surface Water	7	0	1,534	567	2,663	0	4,471	2,124	2,252	4,432	0	0	0	0	0	0	5,741	2,718	0	3,890	1,772	4,423	4,165	0	**1,772**
Imported Water	8	0	0	0	0	0	0	0	0	0	0	0	0	2,000 *	1,594 *	1,933 *	0	0	0	0	0	0	0	0	**0**
Subtotal, Inflow	9	*2,899*	*12,452*	*9,343*	*28,523*	*4,788*	*25,764*	*9,919*	*14,406*	*26,745*	*3,003*	*3,070*	*2,685*	*1,369*	*7,899*	*3,576*	*25,949*	*13,320*	*1,383*	*12,444*	*4,952*	*13,164*	*21,251*	*3,509*	***10,975***
Outflow																									
Pumping	10	8,390	7,702	7,960	7,747	8,885	8,238	11,906	12,812	11,611	11,930	11,645	10,369	7,990	7,451	7,826	8,838	11,526	10,953	9,996	9,577	8,743	8,308	7,725	**9,484**
Subsurface Flow	11	0	0	0	0	0	3,769	3,618	3,769	7,991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**833**
Subtotal, Outflow	12	*8,390*	*7,702*	*7,960*	*7,747*	*8,885*	*12,007*	*15,524*	*16,581*	*19,602*	*11,930*	*11,645*	*10,369*	*7,990*	*7,451*	*7,826*	*8,838*	*11,526*	*10,953*	*9,996*	*9,577*	*8,743*	*8,308*	*7,725*	***10,316***
Change in Storage	13	*-5,491*	*4,750*	*1,383*	*20,776*	*-4,097*	*13,756*	*-5,606*	*-2,175*	*7,143*	*-8,927*	*-8,575*	*-7,684*	*-6,620*	*448*	*-4,250*	*17,111*	*1,794*	*-9,570*	*2,449*	*-4,625*	*4,420*	*12,943*	*-4,217*	***658***
Annual Planning Yield Estimate	14	**2,899**	**12,452**	**9,343**	**28,523**	**4,788**	**21,994**	**6,300**	**10,636**	**18,754**	**3,003**	**3,070**	**2,685**	**1,369**	**7,899**	**3,576**	**25,949**	**13,320**	**1,383**	**12,444**	**4,952**	**13,164**	**21,251**	**3,509**	10,142

Notes

* Not included in estimate of Planning Yield. See note 7.

1. Estimates of recharge from deep percolation of precipitation were developed using information from Guay (2002), scaled based on the percent of low slope (<10%) land area within the Canyon Basin.
2. Values are based on Guay (2002). Assumes 28% of Reach 5 and 100% of Reach 1 are located within the study area. 75% of channel infiltration is assumed to recharge the basin. The reduced amount is based on calibration with more recent data developed by Aspect Consulting (draft 2014) and is consistent with previous model calibration which required reduction of the channel recharge volume. Grant Avenue Ponds diversions are removed from the recharge volume estimate to avoid double counting.
3. Values are based on a correlation between San Jacinto River flow and Indian Creek flow developed by Aspect Consulting (draft 2014). Correlation between the San Jacinto River recharge estimates were used to fill data gaps caused by the incomplete data record for the Cranston gage
   Poppet Creek added based on relationship between Poppet Creek and Indian Creek presented in Schwartz 1967, Poppet flow = 45% of Indian Creek flow
4. Fraction of water use recharged to aquifer: 0.15
5. Assumes
   - 0.75 fraction sewered
   - 0.6 fraction outdoor use
   - 0.25 fraction of outdoor use to aquifer
   - 0 fraction of sewered indoor use to aquifer
   - 0.9 fraction of OWTS use to aquifer
6. Assumes
   - 0 fraction sewered
   - 0.6 fraction outdoor use
   - 0.25 fraction of outdoor use to aquifer
   - 0.9 fraction of OWTS use to aquifer
7. Data from historical artificial recharge at the Grant Avenue Ponds of diverted San Jacinto River flow
8. Data from historical artificial recharge at the Grant Avenue Ponds of imported water are included for historical comparisons. Recharge of imported water is not included in the final estimation of Planning Yield as such artificial recharge may or may not occur in the future.
9. Subtotal of the above inflow items, except for the Artificial Recharge of Imported Water, as discussed in note 8.
10. Data from EMWD database
11. Assumes flow across Claremont Fault only when within 60 feet of the surface. Volume estimated based on cross sectional area greater than 50 feet and gradient across the fault, developed using groundwater level data, and estimates of K
12. Subtotal of the above outflow items.
13. Inflow minus Outflow
14. Change in Storage plus Pumping. The 1990 - 2012 average of 10,100 represents the final Planning Yield estimate.

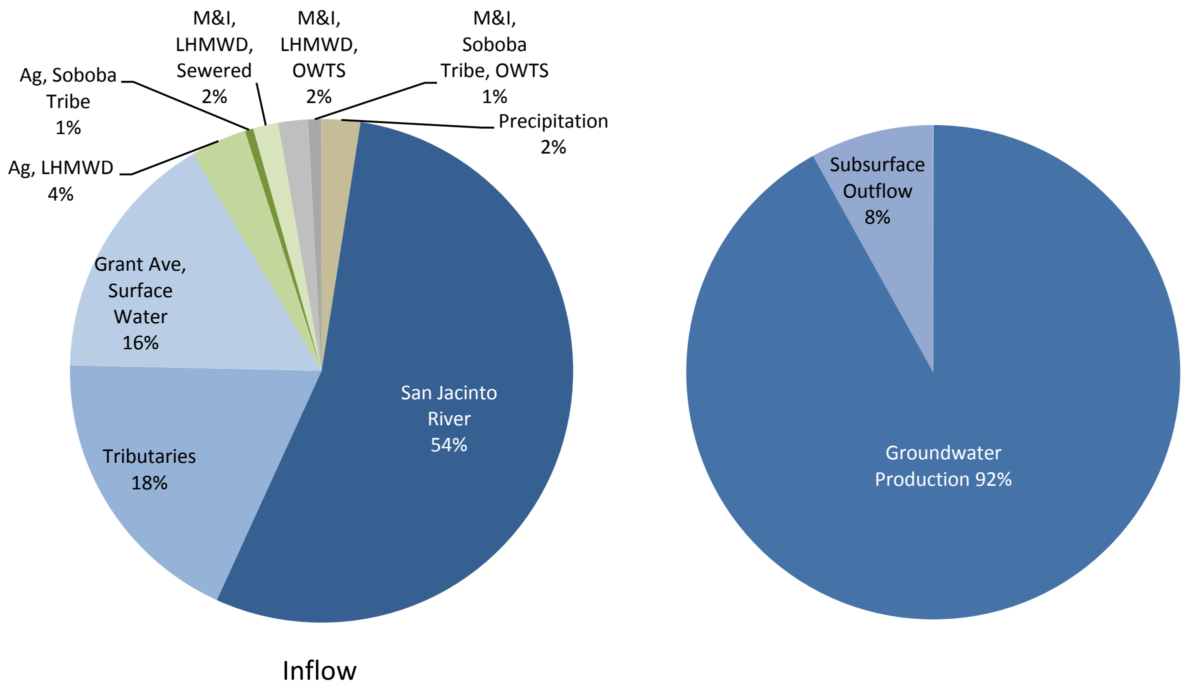


Figure 5-9: Inflow and Outflow Components of Planning Yield

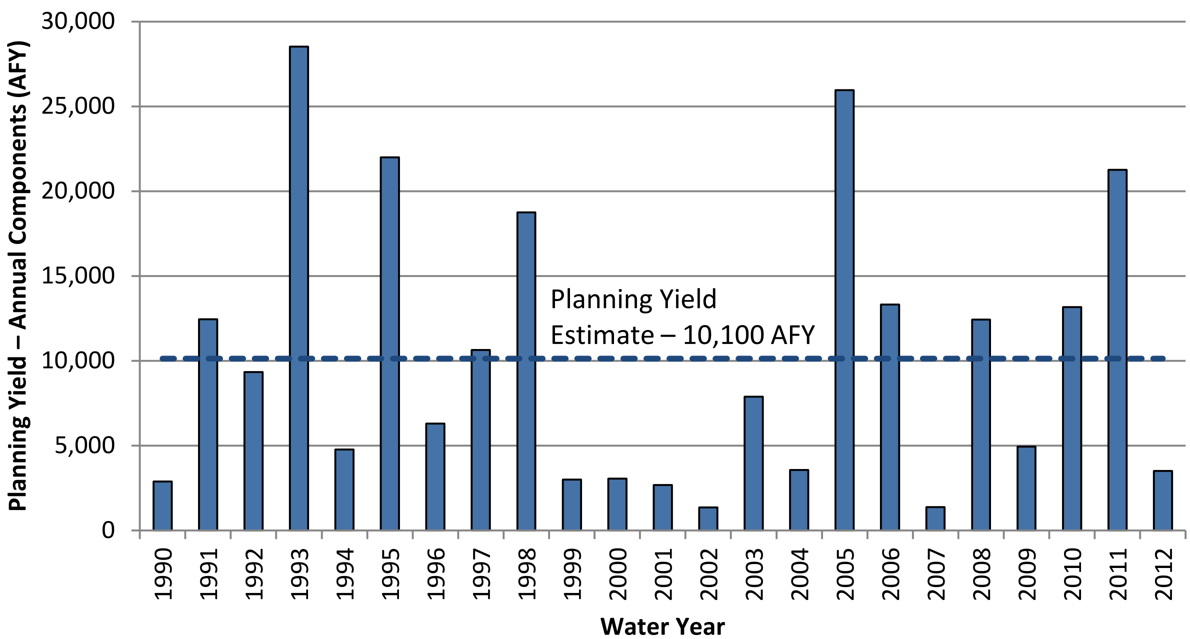


Figure 5-10: Annual Variability within Planning Yield Estimate

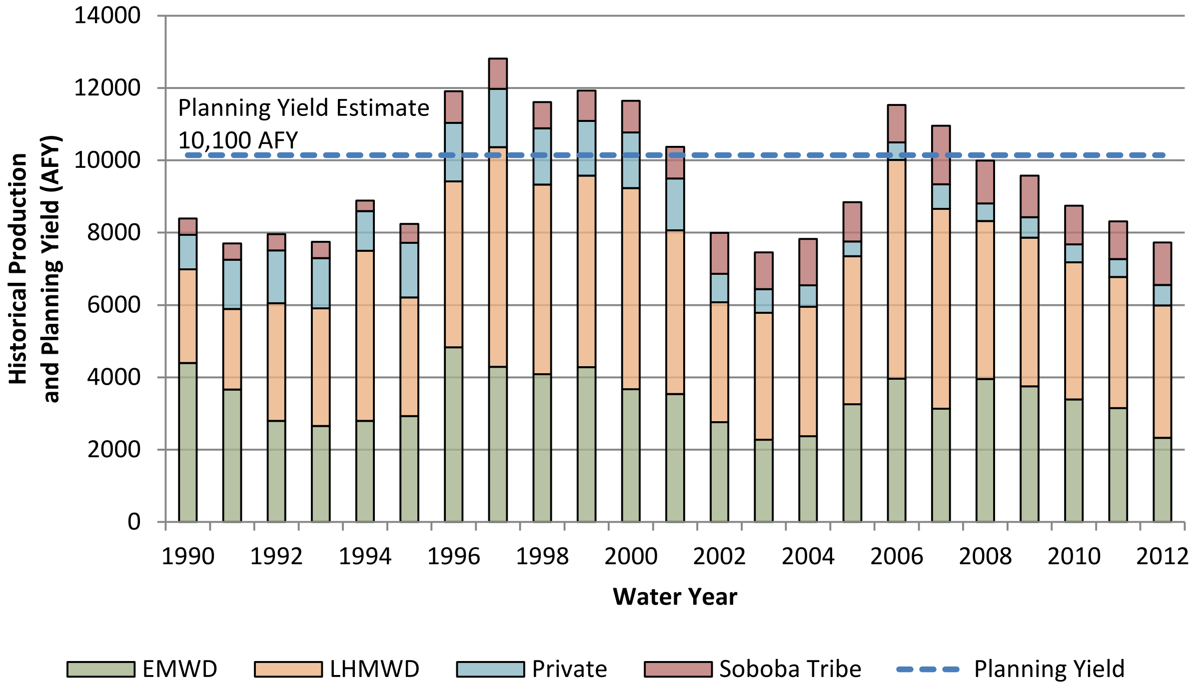


Figure 5-11: Planning Yield in Comparison to Historical Groundwater Production

Section 6 Operating Plan

Management of groundwater in the Canyon Sub-Basin through this Plan is based on four main components:

- Monitoring of groundwater elevations at Key Wells
- Relating those elevations to a Planning Storage value using the Planning Storage Curves
- Comparing Planning Storage to defined triggers, which are based on critical groundwater elevations in the basin, and implementing defined actions based on trigger status
- Managing the Plan through reporting on new and prior actions; data sharing and communication; and comprehensive monitoring to verify or improve triggers and actions presented in this Plan, as well as to support other management needs.

The major technical components the Plan are presented below.

6.1 Key Wells

To support this Plan, the Key Wells will be monitored twice annually, in spring and fall, for groundwater elevation, with additional measurements as needed to improve basin understanding and support the annual measurement. The spring groundwater elevations taken on the first workday in April will be converted to estimates of Planning Storage using the Planning Storage Curve for each of the Key Wells. The estimates of Planning Storage will then be averaged and compared to the triggers; based on the trigger status, defined actions will be taken.

6.1.1 Selection of Key Wells

Key Wells are identified wells that are monitored to provide information on the level of storage in the basin. Key Wells were selected based on:

- Availability of data on well construction and lithology
- Anticipated longevity of the well
- Ability of groundwater elevations at the well to track overall basin Planning Storage
- Participant (i.e., EMWD, LHMWD, or Soboba Tribe) ownership to facilitate long-term access

Initially, Canyon Sub-Basin wells were screened to identify candidate wells for more detailed analysis. This screening process identified wells with:

- Construction and lithology information
- Groundwater elevation measurements with a period of record extending minimally from 1990 to present
- Reasonably consistent monthly measurements

This initial screening resulted in the identification of six candidate wells. Two Soboba Tribe wells were added into consideration, as protection of water levels at this area is a key driver for the overall Plan. Additionally, EMWD’s Cienega 6 and LHMWD’s LHMWD 16 were added into consideration based on recommendations as being more suitable than different wells proposed from that same well owner in a similar location. The candidate wells considered are shown in Figure 6-1.

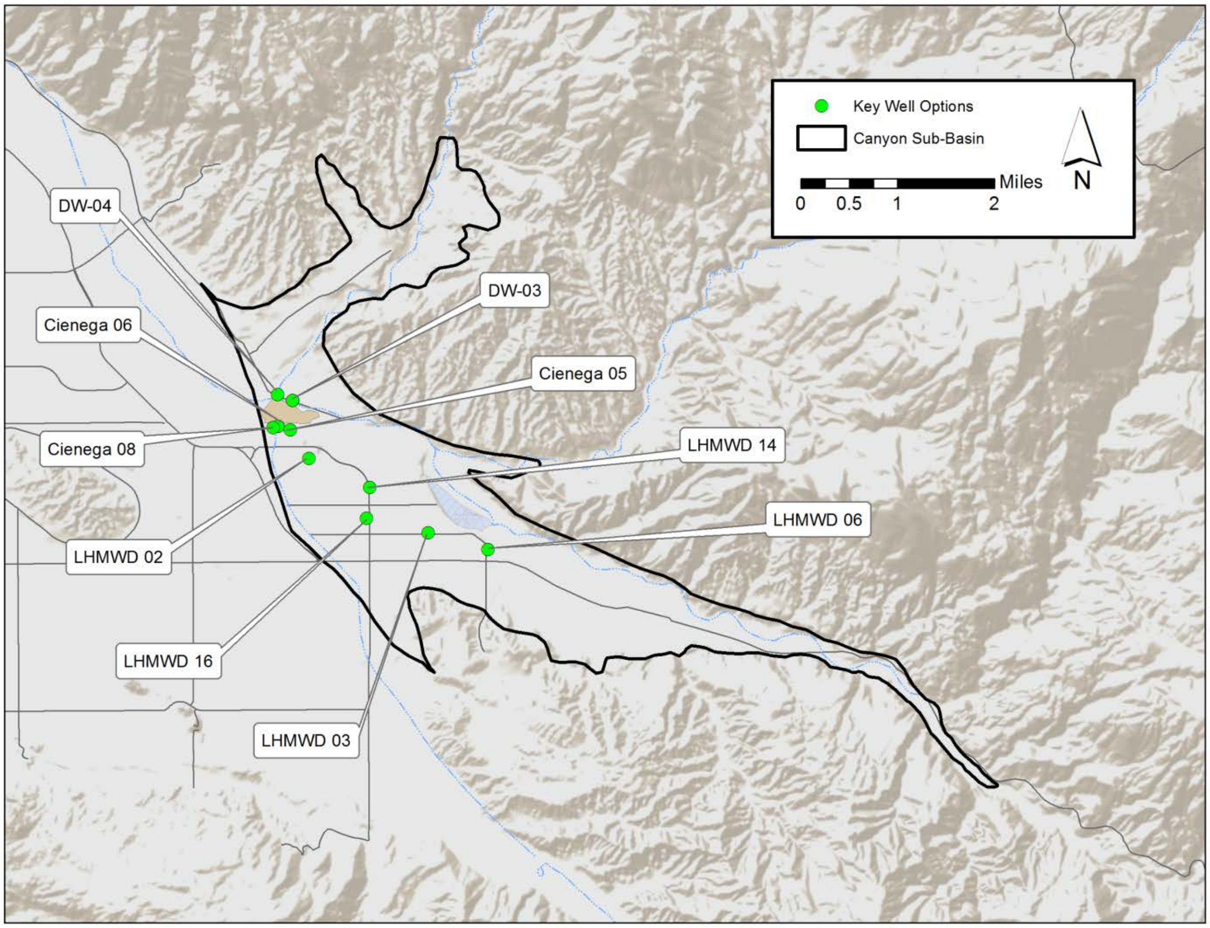


Figure 6-1: Candidate Wells Considered for Key Wells

Further study was conducted on the candidate wells to determine the relationship between groundwater elevation and Planning Storage estimates at each of the wells, both for contour-based groundwater elevation and for measurement-based groundwater elevation. This effort identified wells that were better able to track Planning Storage using groundwater elevation data at that individual well. The study was augmented with discussions with the well owners to incorporate unusual circumstances related to individual wells, such as recent inability to measure groundwater elevations at LHMWD 14 and the related suggestion to utilize the nearby newly constructed LHMWD 16.

Based on this additional analysis, Key Wells were identified, as shown in Table 6-1 and Figure 6-2.

Table 6-1: Key Wells

Key Well	Use	Owner	Location[1]	Ground Surface Elevation (ft msl)	Monitoring Point Elevation (ft msl)	Perforated Interval(s) (ft bgs)
DW-03	Production Well	Soboba Tribe	6362733, 2223727	1679.98	1681.94	335-415 490-510 510-535 570-630 660-690 745-890 925-970 1045-1080 1130-1160
Cienega 6	Monitoring Well	EMWD	6362078, 2222576	1668.8	1667.7	50-503
LHMWD 16	Production Well	LHMWD	6366077, 2218389	1744	1744	480-980

Notes: 1. Coordinates are presented as easting and northing, NAD 83, California State Plane VI, feet
ft: feet
msl: mean sea level
bgs: below ground surface
EMWD: Eastern Municipal Water District
LHMWD: Lake Hemet Municipal Water District

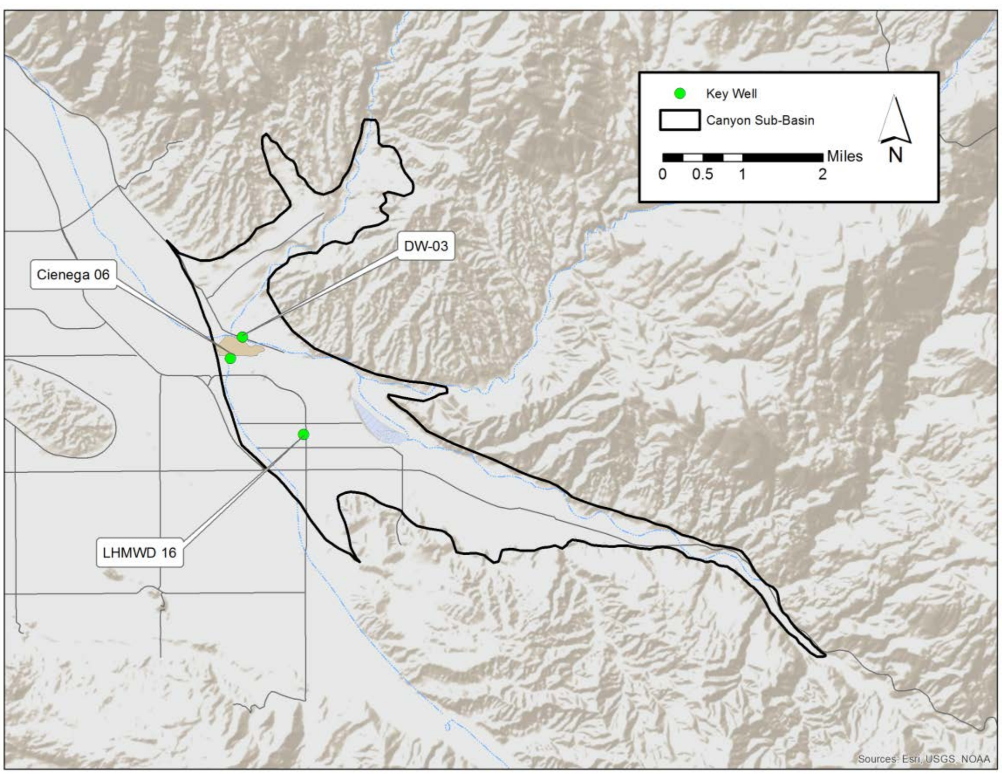


Figure 6-2: Key Wells

The Planning Storage Curves in the following subsection show the extent to which the groundwater elevations are capable of representing basinwide Planning Storage.

Basinwide Planning Storage is estimated using a weighted average with a 50% weight for DW-03 and 25% weight for both Cienega 6 and LHMWD 16. This 50% weight for DW-03 is intended to reflect the goal of being protective of groundwater elevations in the vicinity of the Soboba wells. The inclusion of Cienega 6 and LHMWD 16 assists in representing basinwide conditions, and the use of multiple wells is intended to smooth potential anomalous water level measurements that may occur.

6.2 Planning Storage Curves

Planning Storage Curves relate groundwater elevations at a specific well to the Planning Storage estimate, based on spring groundwater conditions. The Planning Storage Curves were developed based on the contoured historical groundwater elevations and the hypothetical low groundwater elevations conditions, as discussed in Section 4.1. Using these contours, a groundwater elevation was developed for each year and paired with the estimate of Planning Storage. The Planning Storage Curve was then developed as a linear trend line to these data.

Planning Storage Curves were required for each Key Well so that each spring groundwater elevation measurement can be converted into an estimate of Planning Storage, which can then be averaged with the other Key Wells and compared to the triggers to determine the appropriate trigger action.

Planning Storage Curves are presented below for the three Key Wells, including the equation for use in estimating Planning Storage based on groundwater elevation data.

- DW-03 (Figure 6-3)
- Cienega 6 (Figure 6-4)
- LHMWD 16 (Figure 6-5)

Additionally, Planning Storage Curves were also required to convert critical groundwater elevations at Soboba Tribe wells into Planning Storage-based triggers. Planning Storage Curves are presented below for two additional Soboba Tribe wells, including the equation for use in estimating Planning Storage based on groundwater elevation data.

- DW-04 (Figure 6-6)
- IW-02 (Figure 6-7)

Soboba Tribe well DW-01 had insufficient measured spring groundwater elevations to perform this analysis.

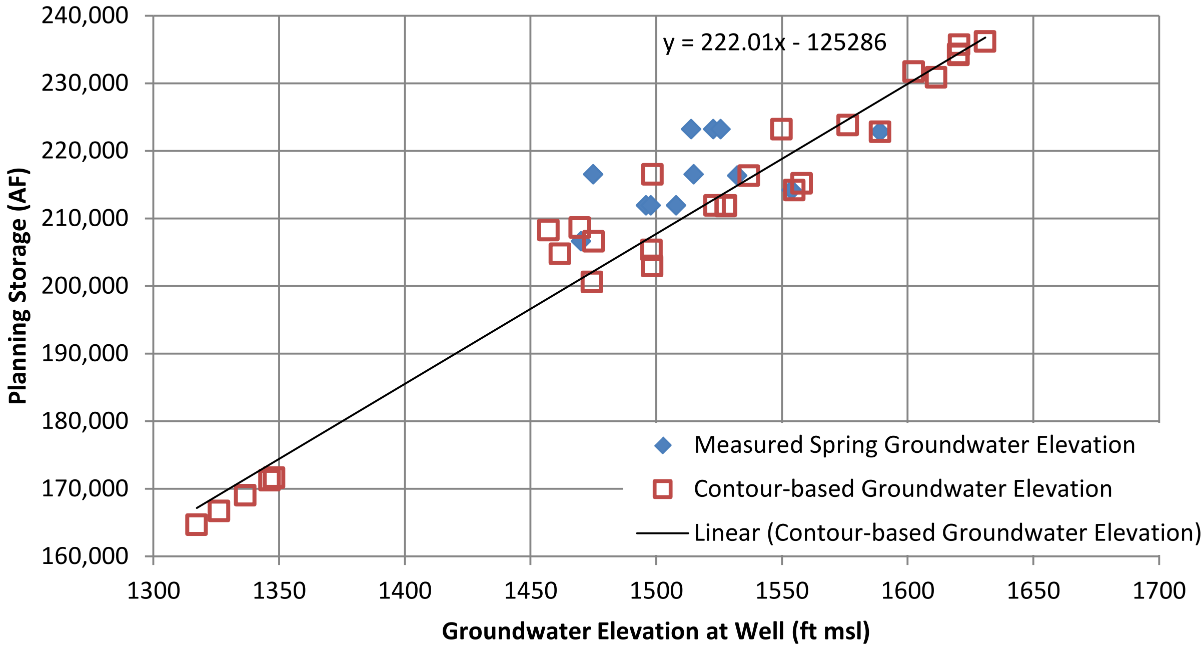


Figure 6-3: Planning Storage Curve: DW-03

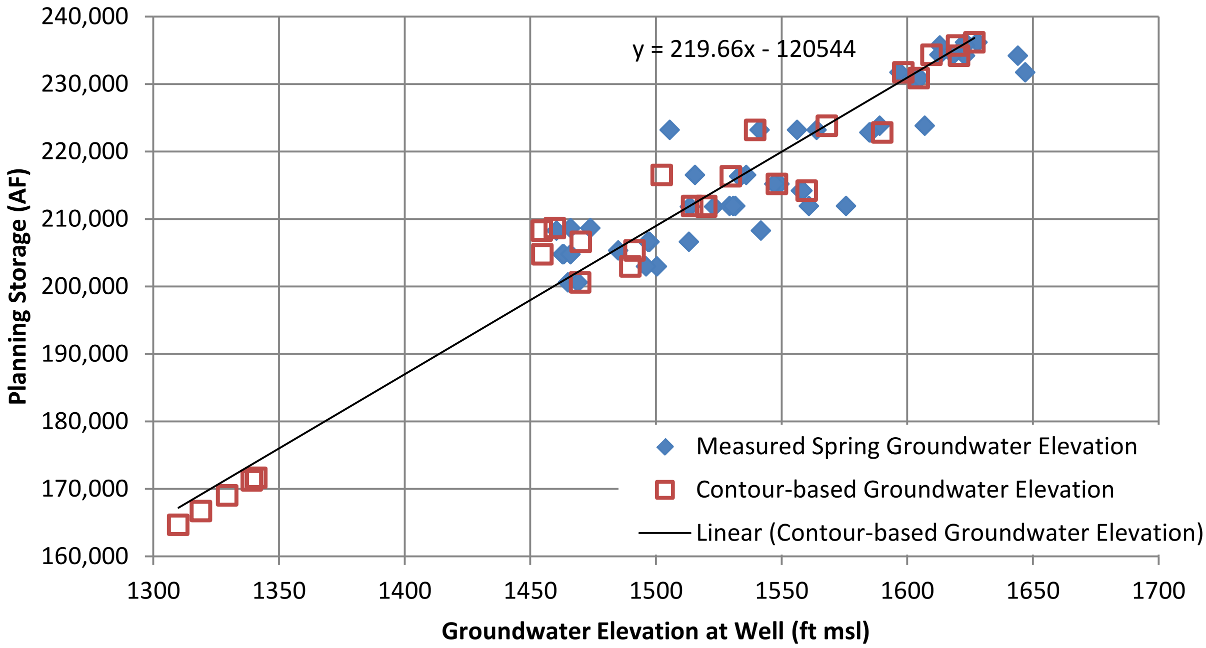


Figure 6-4: Planning Storage Curve: Cienega 6

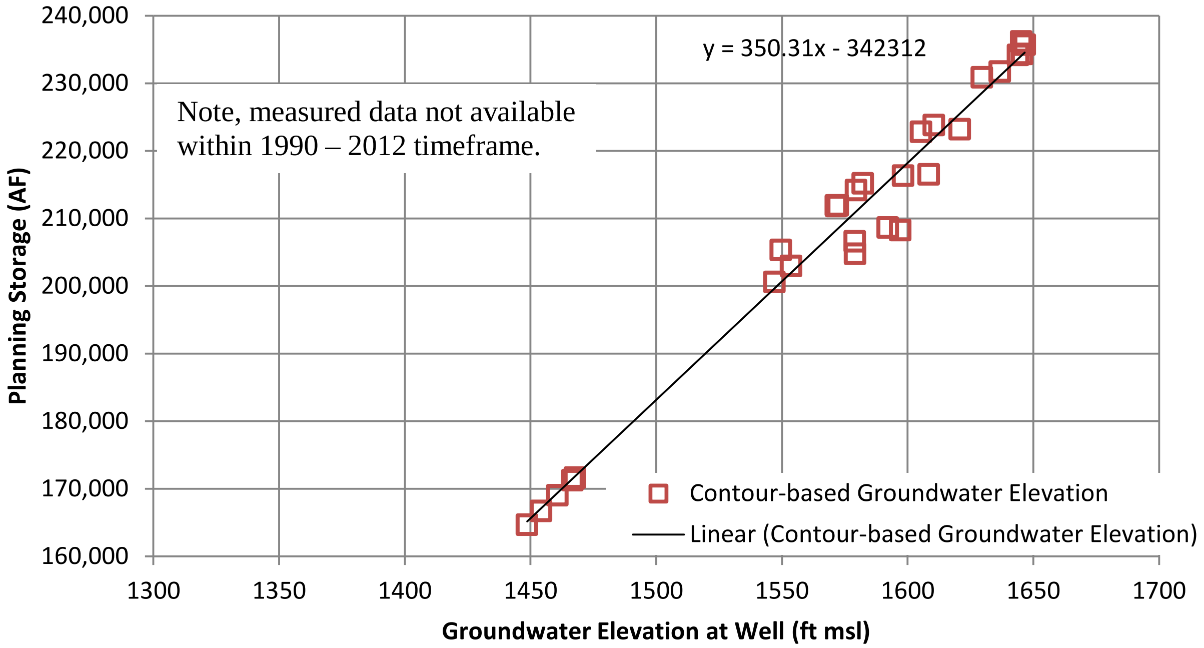


Figure 6-5: Planning Storage Curve: LHMWD 16

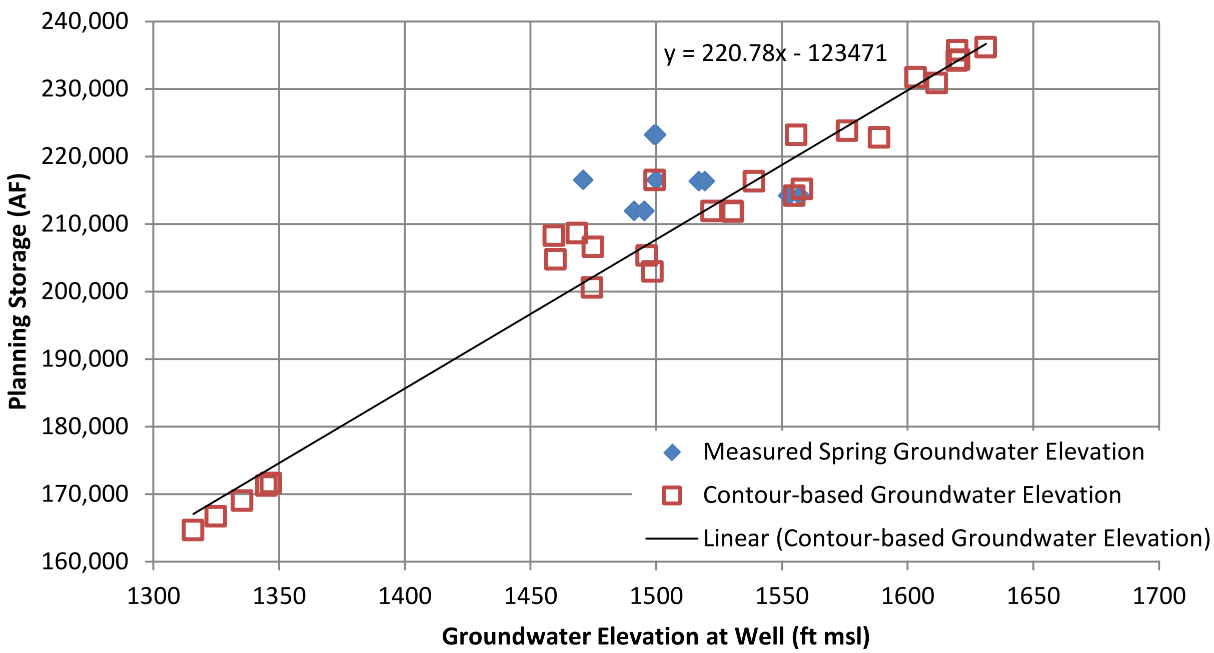


Figure 6-6: Planning Storage Curve: DW-04

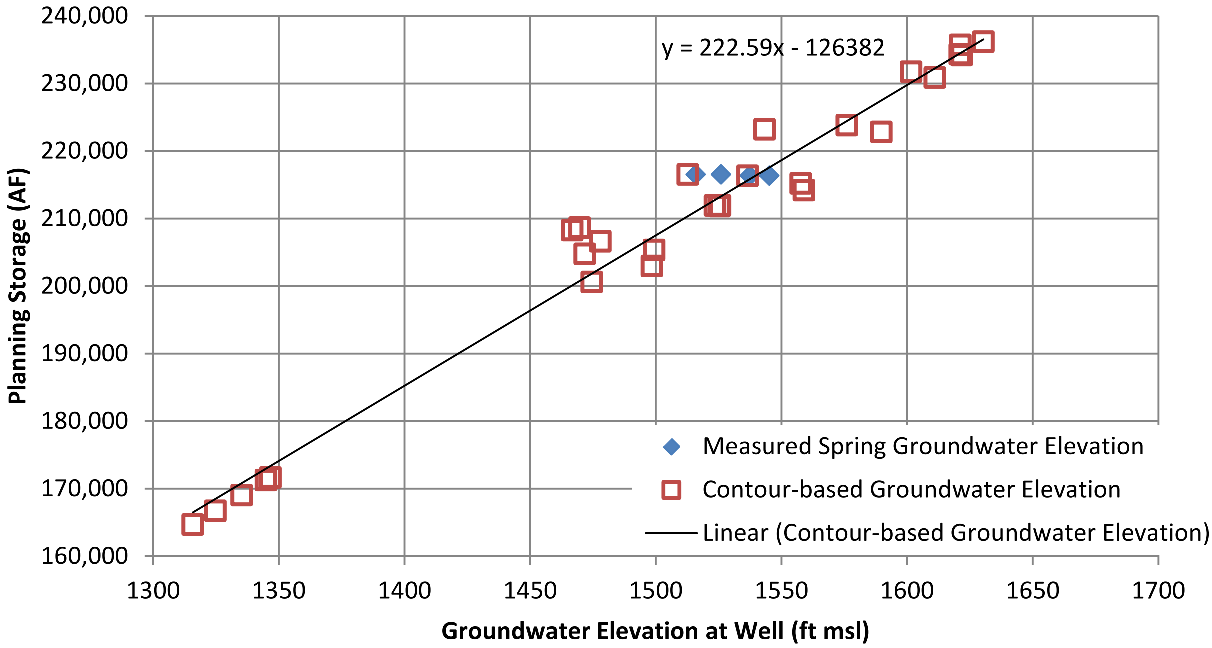


Figure 6-7: Planning Storage Curve: IW-02

6.3 Triggers and Actions

Triggers were developed to be protective of groundwater production from the Soboba Tribe wells, and other wells in the basin, while minimizing the operational impacts to EMWD and LHMWD, who would be required to reduce groundwater production, increase recharge, or supply supplemental water directly to the Soboba Tribe as a result of triggered actions. Note that all recharge water must comply with Section 4.2 of the Settlement Agreement.

The triggers were developed based on groundwater elevations at the Soboba wells and converted to Planning Storage based on Planning Storage Curves for the Soboba Tribe wells.

Triggers were developed for four different levels:

- Proactive trigger
  - Early response (higher groundwater elevation conditions)
  - Reduced impact (longer time period to return to trigger)
- Responsive trigger
  - Later response (lower groundwater elevation conditions)
  - Higher impact (shorter time period to return to trigger)
- Near-Critical trigger
  - Same response as Responsive Trigger
  - Acts as a warning that groundwater elevations are nearing the Critical trigger
- Critical trigger
  - Critical levels (lowest groundwater elevation conditions)

- Highest impact (most severe production restrictions or recharge requirements)

6.3.1 Trigger Groundwater Elevations

Groundwater elevations that were used to develop the triggers are described below for the four different trigger levels.

6.3.1.1 Proactive Management Groundwater Elevations

Proactive management of groundwater storage is desired to minimize the severity of limitations on groundwater production by EMWD and LHMWD. Proactive management was developed to allow for action when groundwater levels are below levels where the basin is thought to have subsurface flow across the Claremont Fault into the San Jacinto Upper Pressure Management Zone (between 40 and 60 feet bgs) and below levels that are conducive to liquefaction (50 feet bgs). Historical analysis of groundwater levels indicated such shallow groundwater level conditions occurred in 1995, 1996, 1997, and 1998 near the Cienega wellfield, as shown in Figure 6-8. Uncertainty in the estimate and the need to be protective against liquefaction that could occur with subsequent wet periods suggested the need to include a contingency. Thus, the Proactive Management Groundwater Elevation was set at 70 feet below ground surface near the Cienega wellfield.

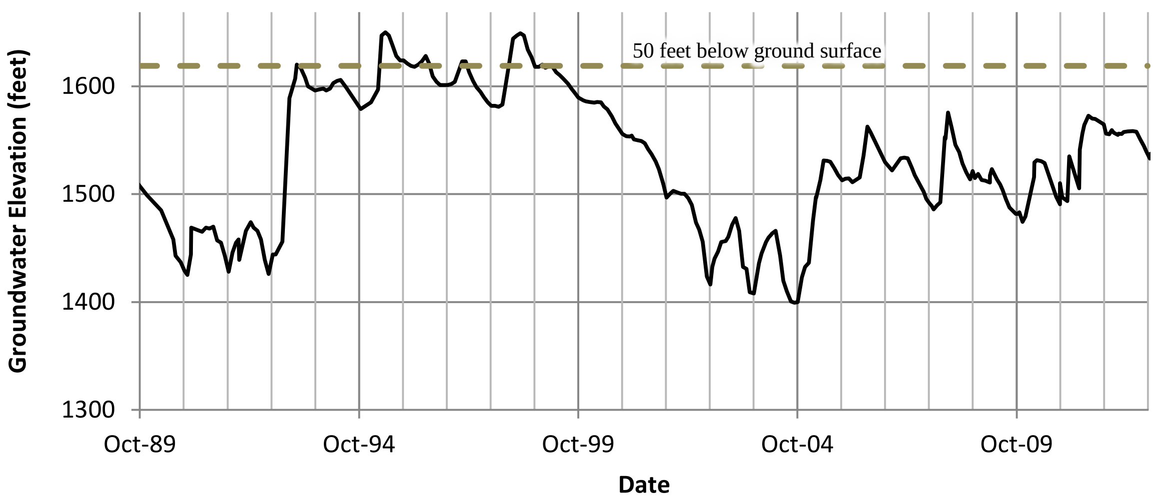


Figure 6-8: Groundwater Elevation, Relative to 50 Feet below Ground Surface, Cienega 6

6.3.1.2 Responsive Management Groundwater Elevations

An additional trigger was developed for groundwater elevations between the Proactive and Near-Critical levels. This Responsive trigger is not based on a specific elevation, but is rather based on volume and the time that would result in critical conditions in the basin. The development of this trigger is described in the Trigger Planning Storage section.

6.3.1.3 Near-Critical Groundwater Elevations

The Near-Critical trigger was developed for conditions nearing critical levels. Like the Responsive trigger, this trigger was not based on a specific elevation. Instead, the Near-Critical trigger was based on production volume that would result in minimal available Net Production for LHMWD and EMWD. The development of this trigger is described in the Trigger Planning Storage section.

6.3.1.4 Critical Groundwater Elevations

The Critical groundwater elevation trigger was established to identify when the groundwater elevations in the basin are nearing the point where the Soboba Tribe may be unable to meet its supply needs for

Canyon Sub-Basin groundwater within the context of the Soboba Agreement. The methodology for developing this trigger elevation included an analysis of estimated critical water levels for Soboba Tribe wells. The critical water levels were developed by the Soboba Tribe in Aspect Consulting (2014) and are described below based on that information.

Three potential issues associated with lower groundwater levels were used in the analysis:

- Pump Intake Submergence – Groundwater levels within 10 feet of the pump intake results in the potential for entrainment of air and damage to the pump.
- Minimum Flow – Reduced groundwater levels reduce the flow rate of the pump and results in the potential for increased wear and reduced pump life. Manufacturers set a minimum recommended continuous flow for each model.
- Well Yield – Reduced groundwater levels can result in production capacity exceeding the flow through the screen, resulting in potential entrainment of air and damage to the pump.

Analysis required assumptions for specific capacity at groundwater levels that were below what has been experienced historically. These specific capacity estimates were necessary to convert pumping water levels (where critical conditions exist) to static water levels (which will be monitored), and to estimate the volume of water that could be produced at the wells. Uncertainty existed as to how to extrapolate these data. Monitoring of specific capacity under this Plan is included to allow for adjustments to the trigger should the original extrapolation be found to be not sufficiently accurate.

The results of the Aspect Consulting (2014) analysis are shown in Table 6-2, which shows the shallowest critical groundwater elevation at IW-02 with a static water level at 1,405 ft msl. Three wells, including IW-02, are limited by well yield, while the fourth well, DW-04, is limited by submergence. Figure 6-9 relates the groundwater elevation to groundwater production capacity at each well and for the combined wells, assuming a 75% run duration. It was estimated that the Soboba Tribe would be capable of producing the 3,000 AFY from the Canyon Sub-Basin discussed in the Settlement Agreement when groundwater levels are greater than 1,400 ft msl. Current (2013) Soboba groundwater production from the Canyon is approximately 1,000 AFY, with increased production anticipated in the future. The current level of production was estimated to be achievable with groundwater levels at 1,330 ft msl (Aspect Consulting, 2014).

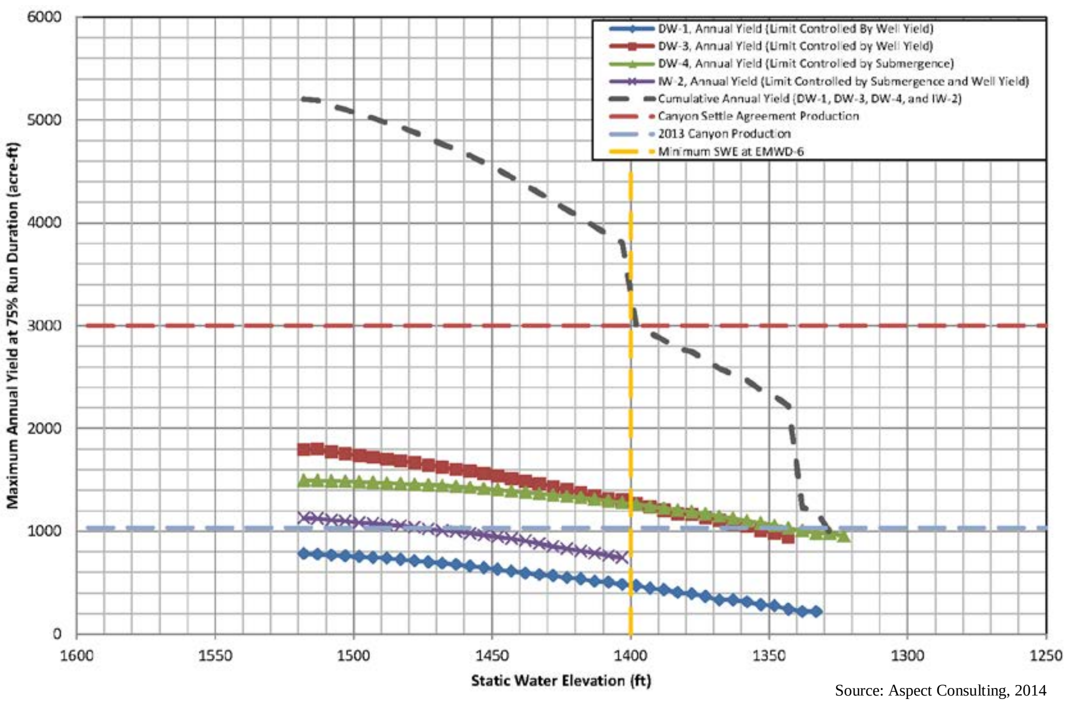
Given the anticipated growth of the Soboba Tribe's water demands and the desire for long-term groundwater management, the Critical trigger for this Plan was based on avoiding groundwater levels below 1,420 ft msl at the Soboba wells, which corresponds to the groundwater elevation where 3,000 AFY can be produced from the Canyon Sub-Basin by the Soboba Tribe wells at this time, with the addition of a 20 foot contingency to account for uncertainties. As discussed below and in Section 6.3.2.3, the spring adjustment for 1,420 ft msl results in a spring equivalent groundwater elevation of 1,450 ft msl.

Table 6-2: Critical Groundwater Elevations, Soboba Tribe Wells

Item	IW-02	DW-01	DW-03	DW-04
Pump Model	American Marsh 11LC	Goulds 9RCHC	American Marsh 13MC	Goulds 11CHC
Pump Setting[1] (ft, bgs)	405	460	468	470
WL at Minimum Pump Submergence (ft, bgs)	395	450	458	460
Minimum Recommended Continuous Flow (gpm)	425	160	780	775
Minimum Operational SWL Elevation (ft)	1405	1335	1345	1325
SWL Elevation corresponding to 3000 AFY Production (ft)	1400			
with 20 ft contingency (ft)	1420			
SWL Elevation corresponding to 2013 Production (1036 AF) (ft)	1330			
with 20 ft contingency (ft)	1350			

Notes: 1. At effective date of Settlement Agreement.
Assumes 75% pumping duration
bgs: below ground surface
ft: feet
gpm: gallons per minute
SWL: static water level
WL: water level

Source: Aspect Consulting, 2014.



Source: Aspect Consulting, 2014

Figure 6-9: Well Yield and Static Groundwater Elevations

These critical water levels are most likely to occur in the late summer and fall, following the period of highest demand and lowest recharge. Monitoring is best performed in the spring, as that time period captures the bulk of wintertime recharge, which is a large component of overall recharge and is highly variable. To address this spring-to-fall time gap between monitoring and potential critical levels, a spring adjusted critical water level was developed for use as the trigger.

The spring adjustment was developed based on historical data at the Soboba Tribe wells, which indicated that from spring to fall there is typically a decline in groundwater levels between 90 and 125 feet. One hundred feet was selected as the spring adjustment, recognizing that this was based on historical levels of groundwater production. The spring adjustment was scaled based on the proposed reduction in production (or increase in recharge) using the Proactive or Responsive action levels, compared to the long-term historical groundwater production of 9,500 AFY. That is, if production were to be reduced (or recharge increased) by 25% based on the trigger action at that level, then the spring adjustment would be reduced by 25% to 75 feet.

The spring adjustment is performed only once, to define the Critical Trigger, as described in the following sub-section. Future spring monitoring, as part of implementation of this Plan, is then compared to the Proactive, Responsive, Near-Critical, and Critical trigger, all of which relate to spring groundwater levels. No further spring adjustments are necessary.

6.3.2 Trigger Planning Storage

Triggers were based on Planning Storage to allow for monitoring via multiple Key Wells to meet groundwater elevation needs at the Soboba Tribe wells. A description of the development of the Proactive trigger, Responsive trigger, Near-Critical trigger, and Critical trigger is provided below, based on the groundwater elevation information in Section 6.3.1.

Planning Storage below the triggers results in actions to increase Planning Storage, with actions described in Section 6.3.3.

6.3.2.1 Proactive Trigger

The Proactive trigger was set at a storage level near where outflow conditions across the fault are thought to have occurred in the past and below levels where liquefaction is thought to become an issue. As described in Section 6.3.1, this level was set at 50 feet below ground surface, plus a 20 foot contingency, resulting in a level of 70 feet below ground surface. The estimated Planning Storage at Cienega 6 at this level (1,599 ft) is 231,000 AF, based on the Planning Storage Curve (see Section 6.2). This value was adjusted to 225,000 AF for the final trigger to avoid nearing levels of potential liquefaction and outflow across the Claremont Fault.

6.3.2.2 Responsive Trigger

The Responsive trigger was set at 10,000 AF below the Proactive trigger, 215,000 AF. This level provides 18,000 AF of Planning Storage between the Responsive trigger and the Critical trigger. Under drought conditions similar to 1999 – 2002, the defined trigger levels and associated actions described under Section 6.3.3 will allow for eight years of incrementally reduced production (based on Responsive trigger actions described in Section 6.3.3) before reaching the Critical trigger.

6.3.2.3 Near-Critical Trigger

The Near-Critical trigger was set as water levels approach the critical water level for the Soboba Tribe wells and was designed to provide a warning that water levels are approaching the Critical trigger. The Planning Storage of 205,000 AF is the Near-Critical Trigger, acting as a warning rather than a change in management actions. Using the Responsive trigger action formula in Section 6.3.3, a Planning Storage of 205,000 AF results in a Basinwide Net Production of 5,100 AFY. Given the Soboba Tribe's ability of the Soboba Tribe to pump 3,000 AFY from the Canyon Sub-Basin and the presence of Private Pumpers that produced approximately 1,000 AFY from 1984 – 2013, there would potentially be very little Basinwide Net Production available to EMWD or LHMWD at this or lower levels of Planning Storage.

6.3.2.4 Critical Trigger

The Critical trigger was set based on the critical groundwater elevations indicated by analysis of the Soboba Tribe wells. The Planning Storage that triggers this action was developed based on the critical water level of 1,420 ft msl, as discussed in Section 6.3.1. The spring adjustment for this value results in a spring equivalent groundwater elevation of 1,450 ft msl. The Planning Storage Curves, averaged for the DW-03, DW-04, and IW-02, show an associated Planning Storage of 197,000 AF, which is the Critical trigger.

6.3.3 Trigger Actions

Planning Storage below the triggers results in actions to slow or reverse the decline in Planning Storage. Actions were based on either reduced production or increased recharge, with quantities developed based on the specific trigger. The difference between production and artificial recharge with imported water is termed Basinwide Net Production, which can be reduced through less production or more recharge. Basinwide Net Production includes all artificial recharge by imported water, regardless of entity, and production by all wells, including private and Soboba Tribe wells.

Trigger actions are described below, and summarized in Figure 6-10. Note that entities may at any time take voluntary actions beyond what is called for by the trigger actions.

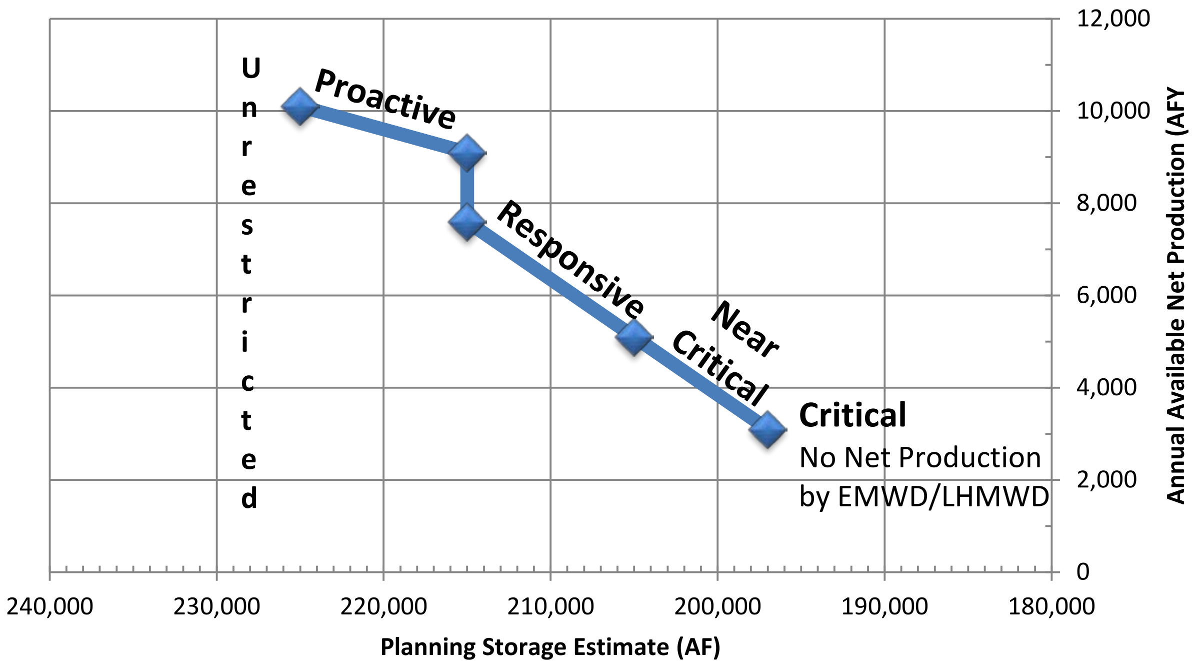


Figure 6-10: Summary of Trigger Levels and Net Production Limits

6.3.3.1 Proactive Trigger

The Proactive trigger was designed to allow for actions to benefit the basin at a scale that can be more easily achieved by the water purveyors. The Proactive trigger was set at a storage level below where outflow conditions across the fault are thought to have occurred in the past and below levels where liquefaction is thought to become an issue. As described in Section 6.3.2, the Proactive trigger was set at 225,000 AF. Storage above this trigger results in unrestricted production (subject to overall limitations by the Watermaster). This unrestricted production was intended to encourage continued natural recharge of the Canyon Sub-Basin as well as to guard against liquefaction. Storage below the Proactive trigger was intended to result in an early response to groundwater level declines that are not considered onerous by either LHMWD or EMWD. For the Proactive trigger, the quantity of water that is needed to bring the basin back to the uppermost threshold is divided by 10 to arrive at the required annual reduction in production or increase in recharge, allowing for a relatively modest response to declining water levels that is considered appropriate for these higher water levels (see Equation 2). With this response, groundwater levels would be expected to return to a Planning Storage of 225,000 AF given 10 years of average hydrology.

$$Basinwide\ Net\ Production = 10{,}100 - \left(\frac{225{,}000 - Planning\ Storage}{10}\right) \qquad [2]$$

6.3.3.2 Responsive Trigger

The Responsive trigger was designed to allow for a stronger response to lower groundwater levels. The Planning Storage of 215,000 AF triggers an action of limiting Basinwide Net Production based on Equation 3. The Responsive trigger formula was designed to move the basin towards the 225,000 AF in Planning Storage within a four-year period, should normal hydrology occur.

$$Basinwide\ Net\ Production = 10{,}100 - \left(\frac{225{,}000 - Planning\ Storage}{4}\right) \qquad [3]$$

6.3.3.3 Near-Critical Trigger

The Near-Critical trigger is set as water levels approach the critical water level for the Soboba Tribe wells and is designed to provide a warning that water levels are approaching the Critical Trigger. The Planning Storage of 205,000 AF is the upper bound of the Near-Critical Trigger. Acting as a warning rather than a change in management actions, actions of limiting Basinwide Net Production under the Near-Critical trigger are defined using the same formula as defined for the Responsive trigger (see Equation 3).

6.3.3.4 Critical Trigger

The Critical trigger is set near the critical water level for the Soboba Tribe wells and is designed to minimize the risk from variability in precipitation by setting the response at a level consistent with the dry period planning yield. The dry period Planning Yield is estimated as 2,500 AFY, which is based on the average of the four driest consecutive years within the 1990 – 2012 period analyzed for the Planning Yield: 1999 – 2002. Future Soboba Tribe and private groundwater production are anticipated to exceed 2,500 AFY. As this Plan does not require reduction in groundwater production by the Soboba Tribe or private pumpers, Planning Storage of 197,000 AF triggers an action of no Net Production of groundwater by EMWD and LHMWD from the Canyon Sub-basin except as discussed in Subsection 6.3.3.5.

6.3.3.5 Limitations to Meeting Trigger Actions

The ability to meet limitations defined through the trigger actions may not be possible at times due to insufficient available recharge water for the Canyon Sub-Basin and practical limits of the ability of agencies to shift to other alternative water sources. In situations where trigger actions cannot be met, the Participants would convene to discuss and coordinate options to optimize production for the Canyon Sub-Basin.

6.4 Plan Management

Management of the Plan includes regular monitoring, reporting, and updates of technical information and the plan itself.

6.4.1 Monitoring

Monitoring is critical to the success of the Plan and serves two primary purposes: implementing the Plan and improving the Plan.

Plan implementation requires monitoring of the Key Wells to establish trigger status and implement the defined actions. This requires manual water level measurements on the first workday in April.

Plan improvement is a broader category and involves additional monitoring needed to provide a more reliable analysis for future updates of this Plan. As summarized in Table 6-3, this includes:

- Daily transducer readings at the Key Wells and at Soboba wells IW-02, DW-03, and DW-04 to develop a better understanding of seasonal trends as well as to support other analysis, including impacts of well operations, storm events, and recharge activities, among others. Soboba well DW-01 does not have an access port or sounding tube suitable for transducer installation; an access tube and transducer may be installed as part of a future rehabilitation, if feasible. The transducer measurements must be supported by semiannual manual measurements for quality assurance. Semiannual manual measurements to occur at the spring reporting period and a period six months later.
- Semiannual (or more frequent) groundwater elevation monitoring at all accessible Canyon Sub-Basin wells to support future groundwater elevation contours, supporting estimates of basin storage, groundwater model calibration, and the general understanding of flow conditions. Monitoring to occur minimally at the spring reporting period and a period six months later.
- Installation of new monitoring wells, which would also be monitored at least semiannually and would fill gaps in the existing well network, including areas of Poppet Creek, Indian Creek, and upper portions of the San Jacinto River. Dedicated monitoring wells may also be installed in the central portions of the basin. After sufficient water level data has been collected, these dedicated monitoring wells may be considered as future Key Wells, with the benefit of less influence from groundwater production. Switching Key Wells from what is in this Plan to new dedicated monitoring wells will require development of new storage curves used in estimation of the Planning Storage. This will, however, not impact the triggers or trigger levels.

Table 6-3: Groundwater Monitoring

Well	Monitoring	Objective: Plan Implementation	Objective: Plan Improvement
Key Wells Soboba Wells	Transducer (daily)		Seasonal trends Support analysis
	Manual (semiannual[2], or more frequent)	Determine trigger status and related actions[1]	Verify transducer readings
All Other Canyon Wells	Semiannual[2], or more frequent		Support future analysis of groundwater elevations
New Wells	Semiannual[2], or more frequent		Fill data gaps Potential future Key Wells

Notes:
1. Implementation requires only the April measurement.
2. Semiannual measurements to be taken on the first workday of April and October

In addition to the groundwater monitoring, there are several other key monitoring needs to improve the Plan in the future:

- Streamflow monitoring is needed for both upstream and downstream locations. Improvements to the Cranston Gauge are needed to improve reliability and acceptance of these data. Streamflow data downstream of the Canyon Sub-Basin are needed to better quantify recharge from streamflow. This may include outflow from the Soboba Pit or other downstream flow location. The existing State Street Gauge is valuable, but a gauge closer to the Canyon Sub-Basin boundary would provide a better estimate of recharge into the Canyon.
- Precipitation monitoring should continue to support estimates of areal recharge and streamflow recharge.
- Groundwater production, surface water deliveries, and location of septic users should continue to be monitored.
- Specific capacity monitoring should be performed on Soboba Tribe wells to improve the trigger values, particularly during periods of lower groundwater elevation.

Finally, the ability of the Soboba Tribe to pump 3,000 AFY from the Canyon Sub-Basin is a function of both groundwater conditions and Soboba Tribe's groundwater facilities. Monitoring of these facilities is necessary to manage the continued ability to produce groundwater and to identify impacts that are the result of groundwater conditions as opposed to the result of groundwater facilities. Monitoring should include:

- Static water level measurements, at least semiannually. Note that the ability to sound Soboba well DW-01 for groundwater levels is difficult and there is a potential for loss of the probe down the well, which would prohibit future groundwater level measurements until the pump is pulled.
- Specific capacity testing, computed semiannually utilizing static water level measurements.
- Video surveys, when wells are rehabilitated.

All monitoring data should be incorporated into the RWRD and be made available to all participants and the Watermaster.

6.4.2 Annual Monitoring and Reporting

Annual monitoring and reporting will be performed as described below. The Reporting Entity is a working group of the Plan participants, led by EMWD. The Reporting Entity will be responsible for:

- Compiling data from the Key Well owners
- Circulating data to the Plan participants for confirmation
- Performing calculations to estimate trigger status
- Identifying the trigger actions
- Documenting the above activities
- Documenting previous year's trigger actions, production, and recharge
- Circulating the documentation for review and comment
- Coordinating meetings and the sharing of the information with all Plan participants

It is anticipated that the plan itself will be updated periodically to ensure that the Canyon Sub-Basin is managed to provide the maximum benefit possible to the participants while still being protective of its long-term sustainability.

6.4.2.1 Monitoring

Monitoring, as described in Section 6.4.1, will be performed by the well owner. Monitoring of Key Wells for identification of trigger status is required on the first workday in April. Monitoring data is to be provided to the Reporting Entity and to the Plan participants within one week of measurement and will include the manual groundwater elevation measurement as well as manual and transducer measurements for the previous year.

The Reporting Entity or any of the Plan participants may request a supplemental manual groundwater elevation measurement within 1 week of receipt of the data, if the initial measurement is thought to be anomalous. The supplemental measurement will be made within 1 week of the request and will be provided to the Reporting Entity and to the Plan participants within one week of measurement, including the manual groundwater elevation measurement as well as manual and transducer measurements for the previous year. The decision on the use of the initial or the supplemental groundwater elevation measurement will be made through consensus among the Plan participants.

6.4.2.2 Analysis

The Reporting Entity will analyze the data through the following process. A hypothetical example is provided in Appendix C.

- For each of the three wells, convert the elevation data into a Planning Storage Estimate by using the linear regression formula identified on the Planning Storage Curve figure in Section 6.2. The groundwater elevation would be inserted as “x” and the Planning Storage would be the result, “y”.
- Develop a weighted average of the resulting Planning Storage estimates. Add the estimate for Cienega 6, LHMWD 16, and two times the estimate for DW-03. Then, divide the estimate by four.
- Identify the trigger level.
    - If the Planning Storage estimate is greater than 225,000 AF, then there is unrestricted production as related to this Plan.
    - If the Planning Storage estimate is between 215,000 and 225,000 AF, the basin is within the Proactive trigger.
    - If the Planning Storage estimate is between 205,000 and 215,000 AF, the basin is within the Responsive trigger.
    - If the Planning Storage estimate is between 197,000 and 205,000 AF, the basin is within the Near-Critical trigger.
    - If the Planning Storage less than 197,000 AF, the basin is within the Critical trigger.
- Identify the trigger action.
    - Proactive trigger.

$$Basinwide\ Net\ Production = 10{,}100 - \left(\frac{225{,}000 - Planning\ Storage}{10}\right)$$

    - Responsive and Near-Critical triggers.

$$Basinwide\ Net\ Production = 10{,}100 - \left(\frac{225{,}000 - Planning\ Storage}{4}\right)$$

    - Critical trigger.
      No Net Production by LHMWD and EMWD within the Canyon Sub-Basin, subject to certain limitations discussed in Subsection 6.3.3.5.

- Estimate groundwater production by the Soboba Tribe and private pumpers by using the average of the past five-years. Subtract this value from the Basinwide Net Production to identify the volume available to EMWD and LHMWD.
- Coordinate with EMWD and LHMWD to identify individual actions to meet the Basinwide Net Production levels. EMWD and LHMWD will coordinate to develop these actions and to define cost sharing, which will be based on the level of benefits received.

6.4.2.3 Reporting

The Reporting Entity will compile the monitoring data and prepare a draft report by May 1. The draft report will include:

- Summary of activities for the previous two years
- Soboba groundwater supply status, including
  - Groundwater elevation data
  - Groundwater production data
  - Well status
- Canyon Sub-Basin groundwater conditions
  - Groundwater production by entity
  - Artificial recharge
  - Key Well groundwater elevation
  - Estimated Planning Storage
  - Trigger status
  - Trigger actions

The draft will be circulated to EMWD, LHMWD, and the Soboba Tribe. Comments will be provided by May 15. The final report will be developed by June 1. Actions resulting from the report will cover the period July 1 – June 30.

6.4.3 Data Sharing and Communication

Data sharing and communication between EMWD, LHMWD, and the Soboba Tribe are critical for the success of the Plan. This includes sharing data, holding meetings, and as-needed communication through primary contacts for each participant.

6.4.3.1 Data Sharing

The Reporting Entity will facilitate data sharing through the development and maintenance of an ftp site and coordination for the continued maintenance of the RWRD, with access available to all participants. The ftp site and RWRD will allow participants to provide new data and reports and access existing data and reports.

6.4.3.2 Meetings

Meetings are necessary to maintain proper communication between the Plan participants, allowing for timely action on groundwater-related issues including potential future impacts or potential early actions. Meetings will be coordinated by the Reporting Entity and will be held at least annually, coinciding with the release of the draft report in May. Additional meetings will be held when the basin is below the Responsive trigger, with meetings at least quarterly.

6.4.3.3 Primary Contact

Additional communication will be facilitated through the establishment of a primary contact or contacts. Each participant will establish a primary contact or contacts for activities related to this Plan and will provide contact information, including email, telephone, mail, and a physical address. As desired by each participant, multiple contacts may be provided to serve certain functions, such as a contact for policy issues and a contact for data or technical issues.

6.4.4 Updates

This Plan may be updated or modified in the future jointly by the plan participants to refine the technical analysis, refine the management process, or incorporate the use of alternative supplies.

6.4.4.1 Planning Yield Update

Updating the Planning Yield may be necessary to

- Incorporate improved data and relevant analyses for updating the water balance
- Capture changes that occur over time to the hydrologic system due to development, water use practices, and climate change

Future data collection efforts should focus on improving the accuracy of measurements at the Cranston Gauge and on data collection to capture both upstream (Cranston Gauge) and downstream (State Street Gauge, Soboba Pit outflow, or other location) streamflow. Such streamflow data are critical as the San Jacinto River system contributes nearly 90% of the inflow to the groundwater system.

The impact of changes over time to the hydrologic system will vary depending on the changes in land use practices. Periods of intensive urbanization or significant changes in agricultural practices may accelerate the need for updating the Planning Yield. However, as noted above, the San Jacinto River system is the primary driver for the Planning Yield estimate resulting in the estimate being less sensitive to changes in other components of the hydrologic system.

6.4.4.2 Management Process Update

The Plan participants may decide to review the validity of the assumptions and methodology of this Plan. The participants could then direct a review that may include:

- Review of Planning Storage Curves through estimates of Planning Storage beyond 2012 and incorporation of new groundwater elevation data.
- Review of the Critical trigger level through incorporation of new estimates of specific capacity at Soboba Tribe wells
- Incorporation of other new data sources

As LHMWD 16 is a new well, monitoring will be required to ensure that the measured water levels track with the Planning Storage Curve. If future measured groundwater levels at LHMWD 16, or at the other Key Wells, show significant deviation from the Storage Curve then replacement with alternate wells, reduction in the number of Key Wells, or revision of the Storage Curves may be considered.

6.4.4.3 Document Update

It is likely that an update to the technical analysis or the management process will require revision to the Plan. A decision on the need for updates to the Plan will be made by the participants after 5 years, at which point a decision will be made for the frequency of future updates. Should the Plan participants desire to modify various aspects of the Plan, including but not limited to the technical analysis, management process, or the incorporation of alternative supplies, the Plan may be updated at any time by mutual agreement of the participants.

6.4.5 Supply Alternative Planning

The monitoring, analysis, and reporting implemented by this Plan may lead to reduced groundwater production and increased recharge. Additionally, supplemental water may be provided to the Soboba

Tribe as an alternative method to manage the basin and achieve the objectives of the Plan. Decisions on which method to select may require additional coordination, technical work, or planning activities.

6.4.5.1 Groundwater Production

Groundwater production may be reduced by EMWD and LHMWD to reduce outflows and comply with trigger actions. Such reduction may be achieved through conservation or through delivery of alternate water supplies (in-lieu recharge). Reduced groundwater production may require changes to infrastructure to meet customer demand with different supply mixes. EMWD and LHMWD may choose to investigate infrastructure needs and potential costs.

6.4.5.2 Groundwater Recharge

Groundwater recharge may be utilized by EMWD and LHMWD to augment water supplies and comply with trigger actions. Artificial recharge activities require appropriate permits from the Santa Ana RWQCB which would generally involve modeling, monitoring, water quality sampling, and analysis to ensure that groundwater quality in the Canyon Sub-Basin is not significantly impacted by the recharge. EMWD is signatory to *Cooperative Agreement to Protect Water Quality and Encourage the Conjunctive Use of Imported Water in the Santa Ana River Basin*, which likely allows for recharge of State Water Project water in the Canyon Sub-Basin. Groundwater recharge in the Canyon will need to be consistent with Section 6.6.4 of the Stipulated Judgment, Section 4.2 of the Settlement Agreement, and the Cooperative Agreement. State Water Project water has been deemed acceptable in the past and is assumed to be acceptable in the future. Water of lesser quality (e.g., Colorado River Aqueduct water) could potentially be recharged after discussion with Participants, prior written approval by the Soboba Tribe, and regulatory approval. This Plan assumes that the recharge of water from the San Jacinto River and from the State Water Project can occur at the Grant Avenue Ponds, and LHMWD's approval of this Plan is contingent on the ability to recharge State Water Project water at the Grant Avenue Ponds.

LHMWD may consider coordinating with the Santa Ana RWQCB and potentially becoming part of the Cooperative Agreement to allow for LHMWD to recharge State Water Project water in the Canyon Sub-Basin, or may work through EMWD to recharge the basin in accordance with the Cooperative Agreement. EMWD remains committed to working with LHMWD and the Tribe to pursue viable and low cost methods of sustaining Canyon groundwater levels, including potential recharge of water at the Grant Avenue Ponds. Additionally, EMWD and LHMWD may consider estimating the cost of recharging water at Grant Avenue to assist in the decision between reducing production or increasing recharge to meet trigger action requirements.

6.4.5.3 Supplemental Water

As previously stated, the Settlement Agreement establishes the Soboba Tribe production rights at 9,000 AFY from Intake (as defined in the Settlement Agreement, generally the southern portion of the Upper Pressure Sub-Basin, including the portion adjacent to the Canyon Sub-Basin) and Canyon Sub-Basins (within the Hemet/San Jacinto Groundwater Management Area); however, at least 3,000 AFY must be made available for production directly from the Canyon Sub-Basin. If the Canyon Sub-Basin supplies are inadequate to meet the Soboba Tribe's 3,000 AF annual production allocation and demands, then EMWD and LHMWD will be required to provide a supplemental water supply directly to the Soboba Tribe to satisfy production rights demands. Among other goals, this Plan is developed to support responsible and sustainable water management that will allow for the continued ability of the Soboba Tribe to produce 3,000 AFY from the Canyon Sub-Basin, consistent with the implementation of the Settlement Agreement.

The Plan participants may, at some point, decide that it is more advantageous for managing the basin through shortage conditions or to allow for more recharge capture for EMWD and LHMWD to provide a supplemental water supply directly to the Soboba Tribe to satisfy production rights demands. The provision for supplemental water is also included in the Settlement Agreement. Additional information is required to make an informed decision on supplemental water delivery, including:

- The existing cost of groundwater production by the Soboba Tribe;
- Daily flow rate required to satisfy the 3,000 AFY production allocation in the Settlement Agreement;
- The water quality of the proposed supplemental supply; and
- Costs for providing supplemental water, including capital costs and operations and maintenance costs.

The Plan participants may collectively or individually investigate these items to make informed decisions regarding the delivery of supplemental water. Any proposal to supply supplemental water will be coordinated among the Plan participants and may be incorporated into the Plan as a management element, subject to mutual approval by the participants.

Section 7 References

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Appendix A - Memorandum of Understanding

MEMORANDUM OF UNDERSTANDING

OPERATING PLAN FOR THE CANYON SUB-BASIN

This Memorandum of Understanding ("MOU") is by and between the Soboba Band of Luiseño Indians (the "Tribe"), the Eastern Municipal Water District ("EMWD"), and the Lake Hemet Municipal Water District ("LHMWD"). The latter two entities are sometimes collectively referred to as the "Two Agencies," and the Two Agencies and the Tribe are collectively referred to as "the Parties".

RECITALS

A. In the water rights negotiations involving the Tribe, the United States, EMWD, LHMWD, and the Metropolitan Water District of Southern California ("MWD") that led to the Soboba Band of Luiseño Indians Settlement Agreement ("Settlement Agreement"), the Tribe and the United States sought limits on production from the Canyon Sub-Basin ("CSB") by non-Indian parties but ultimately agreed to forego such limits in return for (1) an obligation on the part of EMWD and LHMWD, under paragraph 4.1.C of the Settlement Agreement, to deliver water to the Tribe under certain circumstances, and (2) the requirement that the Tribe and the United States, under paragraph 4.8.A of the Settlement Agreement, must approve the Water Management Plan ("WMP") prepared by the Two Agencies and others before it can become effective. The WMP is to be the physical solution adopted by the Court pursuant to a Stipulated Judgment ("Stipulated Judgment") in an action filed by EMWD to adjudicate various water rights in a described Management Area, of which the CSB is a part. The WMP is to be implemented and operated by a Watermaster ("WM"), appointed by the Court and consisting of one representative of each of the Two Agencies, the Cities of Hemet and San Jacinto and one representing all private pumpers.

B. The Tribe's willingness to forego pumping limits was based on a limit on pumping from the CSB imposed on EMWD by the Fruitvale Judgment of 4,500 afa when the static water level in the CSB is 25 feet or more below ground level in a specifically described well ("Fruitvale Limit").

C. The WMP provides that the WMP supersedes the Fruitvale Judgment, thereby eliminating the Fruitvale Limit.

D. The Tribe is willing to approve the WMP and to recommend that the United States approve the WMP if the Two Agencies will commit to the prompt development of an operating plan for the CSB ("Operating Plan") designed to help avoid shortages that would result in involuntary pumping restrictions on one or more of the Two Agencies, using each of the elements set forth on Attachment 1 that is determined by the Parties to be reasonably, economically, practically, legally and environmentally achievable and funded through a cost-sharing arrangement based on benefits received.

E. Each of the Two Agencies is willing to make such a commitment and to develop such an Operating Plan as quickly as reasonably possible as set forth herein in order that approvals of the WMP by the Tribe and the United States can be obtained.

IT IS THEREFORE AGREED,

1. The Two Agencies will each commit to do what is necessary in the shortest time reasonably possible to cooperatively develop an Operating Plan for the CSB based on, among other things, the elements described on Attachment 1 attached hereto and incorporated herein by reference which are determined by the Tribe and each of the Two Agencies to be reasonably, economically, practically, legally and environmentally achievable and funded through a cost-sharing arrangement based on benefits received. To the extent that projects or elements proposed would have regional benefits as opposed to benefiting one or more of the Parties to this MOU, the Two Agencies will request that the WM participate in the implementation of the element or project. In the absence of the WM's participation, the element or project shall be scaled back so as to benefit only one or more of the Parties. The Parties acknowledge that this MOU does not obligate them to include any or all of these elements in the final Operating Plan for the CSB.

2. The Parties agree that EMWD shall direct the WM to recharge in the CSB, from EMWD's share of the Imported Water supplied by MWD pursuant to the Settlement Agreement, in addition to any other recharge already or normally scheduled for the CSB, an amount of water equal to production from the CSB by EMWD that exceeds the Fruitvale Limit on terms and conditions established by the WM. The additional recharge shall occur in the same year as said excess production by EMWD or as soon thereafter as reasonably possible, to the extent EMWD's share of Imported Water supplied by MWD is available. If EMWD's share of Imported Water supplied by MWD is not available to supply all or part of the additional recharge, EMWD shall make up the balance of the excess production by comparable production cuts within the three subsequent water years. The Parties further agree that the requirements of this paragraph constitute a component of the WMP for the Canyon Management Zone referenced in Section 8.9 of the WMP and acknowledge that the Stipulated Judgment gives EMWD the right to direct the WM to undertake the recharge required herein.

3. The Tribe agrees based on the foregoing to approve the WMP and recommend to the United States that it also approve the WMP.

4. Execution of this MOU may be *via* facsimile or electronic means. Given the governmental character of the Parties, all Parties understand and agree that this MOU can only be effective and binding between and among them provided that the Tribal Council and the Districts' Boards of Directors approve the MOU and authorize its execution. This MOU will be executed in counterparts, each of which will be deemed an original, but all of which constitute one and the same instrument. This MOU shall become effective upon the date the last Party executes it.

5. Each person executing this MOU on a Party's behalf is duly authorized and empowered to do so.

6. All notices or communications required or permitted hereunder shall be in writing and shall be either personally delivered (which shall include delivery by means of professional overnight courier service which confirms receipt in writing [such as Federal Express or UPS]), sent by telecopier or facsimile ("Fax") machine capable of confirming transmission and receipt, or sent by certified or registered mail, return receipt requested, postage prepaid to the following Parties at the addresses or numbers below:

To the Soboba Tribe	Chairperson SOBOBA BAND OF LUISEÑO INDIANS P.O. Box 487 San Jacinto, CA 92581 Telephone (951) 654-2765 Fax (951) 654-4198
With Copy to	LUEBBEN JOHNSON & BARNHOUSE LLP Karl E. Johnson 7424 4th St., NW Los Ranchos de Albuquerque, NM 87107 Telephone (505) 842-6123 Fax (505) 842-6124
To EMWD	General Manager EASTERN MUNICIPAL WATER DISTRICT P.O. Box 8300 Perris, CA 92572-8300 Telephone (951) 928-3777 Fax (951) 928-6112
With Copy to	REDWINE AND SHERRILL Gerald D. Shoaf 1950 Market St. Riverside, CA 92501 Telephone (951) 684-2520 Fax (951) 684-9583
To LHMWD	General Manager LAKE HEMET MUNICIPAL WATER DISTRICT P.O. Box 5039 Hemet, CA 92544 Telephone (951) 658-3241 Fax (951) 766-7031
With Copy to	BEST, BEST & KRIEGER, LLP Bradley E. Neufeld P.O. Box 1028 Riverside, CA 92502-1028 Telephone (951) 686-1450 Fax (951) 686-3083

7. Each of the Parties agrees to take, or cause to be taken, all actions, and to do, or cause to be done, all things necessary, proper or advisable under applicable laws and regulations to consummate and make effective the terms and conditions of this MOU, including the execution of any additional documents that may be necessary.

IN WITNESS WHEREOF, each of the Parties has executed this MOU on the day and year written below.

DATED: Feb. 19, 2009

SOBOBA BAND OF LUISEÑO INDIANS

By: Rosemary Morillo

APPROVED AS TO FORM:

LUEBBEN JOHNSON & BARNHOUSE, LLP

By: ______________________
Karl E. Johnson

DATED: April 1, 2009

EASTERN MUNICIPAL WATER DISTRICT

By: ______________________

APPROVED AS TO FORM:

REDWINE AND SHERRILL

By: ______________________
Gerald D. Shoaf

DATED: April 1, 2009

LAKE HEMET MUNICIPAL WATER DISTRICT

By: ______________________

APPROVED AS TO FORM:

BEST, BEST & KRIEGER

By: ______________________
Bradley E. Neufeld

Elements of a Canyon Sub-Basin Operating Plan

Among the elements that will be considered for inclusion in the Operating Plan for the Canyon Sub-Basin are the following.

1. Artificial Recharge

   a. Maximize recharge of stormwater runoff by coordinating management of Eastern's diversion rights at the Grant Street ponds with the ongoing reclamation of the Soboba gravel pit.

   b. Prioritize use of imported State Water Project water to keep seasonal static water level variations in the Cienega area of the Canyon Sub-basin within recorded historic limits subject to refinement upon completion of modeling and agreement by all Parties.

   c. Permit and construct facilities to implement artificial recharge in the Cienega area. Options include the Fairview Ponds and the Soboba gravel pit (subject to environmental limitations and constraints).

2. Monitoring

   a. Implement continuous stream gauging of Indian and Poppet Creeks on the Soboba Reservation.

   b. The Tribe may provide the sites and gauging structures, and the Two Agencies and/or the Water Master may contract with and pay the U.S. Geological Survey for operation and maintenance.

3. Pumping Restrictions

   a. Implementation of artificial recharge as described above is designed to minimize a need for pumping restrictions in droughts of moderate duration (*e.g.*, those occurring from 1985 – 2007).

   b. In the event of extended drought conditions (*e.g.*, those occurring from the late 1940s to the mid-1960s), the Two Agencies and/or the Water Master may consider proactively limiting pumping to avoid severe shortages.

4. Soboba Gravel Pit Reclamation

   a. Removal of fine sediment to promote recharge while the pit aggrades back to a natural floodplain may be continued, with costs shared by the Tribe and the Two Agencies and/or the Water Master.

   b. The Tribe and the Two Agencies, and/or the Water Master, may cooperate and cost share in permitting and constructing grade control structures and/or other measures on the San Jacinto River to reclaim the natural channel upstream of the pit, and to help address erosion and diversion problems in the Grant Street ponds vicinity.

c. The Parties may explore permitting the reclamation-related actions described above by incorporating them into the U.S. Army Corps of Engineers San Jacinto River Restoration Project or other cooperative projects.

Appendix B - Meeting Attendees

EASTERN MUNICIPAL WATER DISTRICT SINCE 1950

CANYON OPERATING PLAN KICK-OFF MEETING

January 13, 2014
Conference Room 218
11:00 am – 12:00 pm

PRINT NAME	E-MAIL ADDRESS	SIGNATURE
FRANK COATE	FCOATE@SOBOBA-NSN.GOV	[signature]
Erick Miller	emiller@aspectconsulting.com	[signature]
Jim Blanke	jblanke@rmcwater.com	[signature]
Ali Taghavi	ataghavi@rmcwater.com	[signature]
Jayne Joy	joyj@emwd.org	[signature]
John Dotinga	dotingaj@emwd.org	[signature]
Gordon Ng	ngg@emwd.org	[signature]
John Davenin	davenij@emwd.org	[signature]
BRIAN POWELL	POWELLB@EMWD.ORG	[signature]
TOM WAGONER	twagoner@lhmwd.org	Tom Wagoner
Mike Gow	mgow@lhmwd.org	[signature]
C Bachmann	bachmannc@emwd.org	[signature]

Meeting Sign-In Sheet

RMC Water and Environment

EMWD Canyon Operating Plan Project

Subject: 1st Monthly Meeting

Date/Time: February 10th 2014, 10:30 – 12:30 pm

Location: EMWD, Room 101 (Community Room)
2270 Trumble Road, Perris

Name	Signature	Entity	Title	Email	Telephone
Charlie Bachmann	[signature]	EMWD	Assistant General Manager	bachmannc@emwd.org	(951) 928-3777 x_____
Jim Blanke	[signature]	RMC	Senior Hydrogeologist	jblanke@rmcwater.com	(916) 999-8762
Frank Coate	PHONE	Soboba Tribe		fcoate@soboba-nsn.gov	(951) _____-_______
John Daverin	[signature]	EMWD	Senior Engineering Geologist	daverinj@emwd.org	(951) 928-3777 x4584
John Dotinga	[signature]	EMWD	Water Production Manager	dotingaj@emwd.org	(951) 928-3777 x7301
Khos Ghaderi		EMWD	Director of Water Operations	ghaderik@emwd.org	(951) 928-3777 x_____
Mike Gow	[signature]	LHMWD	Asst. General Manager, Chief Engineer	mgow@lhmwd.org	(951) 658-3241 x 238
Jayne Joy		EMWD	Director, Environ. & Regulatory Compliance	joyj@emwd.org	(951) 928-3777 x_____
Kenneth McLaughlin		Soboba Tribe	Director of Public Works	kmclaughlin@soboba-nsn.gov	(951) _____-_______
Erick Miller	PHONE	Soboba Tribe (Aspect Consulting)	Senior Associate Hydrogeologist	emiller@aspectconsulting.com	(206) 780-7715
Behrooz Mortazavi	[signature]	Watermaster	Advisor	bmortazavi@msn.com	(951) _____-_______
Gordon Ng	[signature]	EMWD	Civil Engineering Associate I	ngg@emwd.org	(951) 928-3777 x4512
Brian Jack Powell	[signature]	EMWD	Director of Planning	powellb@emwd.org	(951) 928-3777 x4278
Ali Taghavi	[signature]	RMC	Principal	ataghavi@rmcwater.com	(916) 999-8760
Tom Wagoner	[signature]	LHMWD	General Manager	twagoner@lhmwd.org	(951) 658-3241 x240
AL JAVIER	[signature]	EMWD	ENV. SRVS. MNGR.	JAVIERA@EMWD.ORG	x 6327

Meeting Sign-In Sheet

EMWD Canyon Operating Plan Project

Subject: 2nd Monthly Meeting

Date/Time: March 10th 2014, 10:30 – 12:30 pm

Location: EMWD, Room 101 (Community Room)
2270 Trumble Road, Perris

Name	Signature	Entity	Title	Email	Telephone
Charlie Bachmann	Present	EMWD	Assistant General Manager	bachmannc@emwd.org	(951) 928-3777 x_____
Jim Blanke		RMC	Senior Hydrogeologist	jblanke@rmcwater.com	(916) 999-8762
Frank Coate	Phone	Soboba Tribe		fcoate@soboba-nsn.gov	(951) ______-________
John Daverin		EMWD	Senior Engineering Geologist	daverinj@emwd.org	(951) 928-3777 x4584
John Dotinga		EMWD	Water Production Manager	dotingaj@emwd.org	(951) 928-3777 x7301
Khos Ghaderi	Present	EMWD	Director of Water Operations	ghaderik@emwd.org	(951) 928-3777 x_____
Mike Gow		LHMWD	Asst. General Manager, Chief Engineer	mgow@lhmwd.org	(951) 658-3241 x238
Al Javier		EMWD	Environmental Services Manager	javiera@emwd.org	(951) 928-3777 x6327
Jayne Joy		EMWD	Director, Environ. & Regulatory Compliance	joyj@emwd.org	(951) 928-3777 x_____
Kenneth McLaughlin	Phone	Soboba Tribe	Director of Public Works	kmclaughlin@soboba-nsn.gov	(951) ______-________
Erick Miller	Phone	Soboba Tribe (Aspect Consulting)	Senior Associate Hydrogeologist	emiller@aspectconsulting.com	(206) 780-7715
Behrooz Mortazavi		Watermaster	Advisor	bmortazavi@msn.com	(951) ______-________
Gordon Ng		EMWD	Civil Engineering Associate I	ngg@emwd.org	(951) 928-3777 x4512
Brian Jack Powell		EMWD	Director of Planning	powellb@emwd.org	(951) 928-3777 x4278
Ali Taghavi		RMC	Principal	ataghavi@rmcwater.com	(916) 999-8760
Tom Wagoner		LHMWD	General Manager	twagoner@lhmwd.org	(951) 658-3241 x240

Meeting Sign-In Sheet

RMC water and environment

EMWD Canyon Operating Plan Project

Subject: 3nd Monthly Meeting

Date/Time: April 14th 2014, 10:30 – 12:30 pm

Location: EMWD, Room 218 (Cap. 36) (AV)
2270 Trumble Road, Perris

Name	Signature	Entity	Title	Email	Telephone
Charlie Bachmann		EMWD	Assistant General Manager	bachmannc@emwd.org	(951) 928-3777 x_____
Jim Blanke	[illegible]	RMC	Senior Hydrogeologist	jblanke@rmcwater.com	(916) 999-8762
Frank Coate	Frank Coate	Soboba Tribe		fcoate@soboba-nsn.gov	(951) ______-________
John Daverin	[illegible]	EMWD	Senior Engineering Geologist	daverinj@emwd.org	(951) 928-3777 x4584
John Dotinga	John Dotinga	EMWD	Water Production Manager	dotingaj@emwd.org	(951) 928-3777 x7301
Khos Ghaderi	[illegible]	EMWD	Director of Water Operations	ghaderik@emwd.org	(951) 928-3777 x_____
Mike Gow	PRESENT	LHMWD	Asst. General Manager, Chief Engineer	mgow@lhmwd.org	(951) 658-3241 x238
Al Javier		EMWD	Environmental Services Manager	javiera@emwd.org	(951) 928-3777 x6327
Jayne Joy	[illegible]	EMWD	Director, Environ. & Regulatory Compliance	joyj@emwd.org	(951) 928-3777 x_____
Nick Kanetis		EMWD	Deputy General Manager	kanetisn@emwd.org	(951) 928-3777 x_____
Kenneth McLaughlin		Soboba Tribe	Director of Public Works	kmclaughlin@soboba-nsn.gov	(951) ______-________
Erick Miller	Erick Mill	Soboba Tribe (Aspect Consulting)	Senior Associate Hydrogeologist	emiller@aspectconsulting.com	(206) 780-7715
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Gordon Ng		EMWD	Civil Engineering Associate I	ngg@emwd.org	(951) 928-3777 x4512
Brian Jack Powell	[illegible]	EMWD	Director of Planning	powellb@emwd.org	(951) 928-3777 x4278
Ali Taghavi	[illegible]	RMC	Principal	ataghavi@rmcwater.com	(916) 999-8760
Tom Wagoner	Tom Wagoner	LHMWD	General Manager	twagoner@lhmwd.org	(951) 658-3241 x240

Meeting Sign-In Sheet

RMC water and environment

EMWD Canyon Operating Plan Project

Subject: 4th Monthly Meeting

Date/Time: May 12th 2014, 10 am – 2 pm

Location: EMWD, Room 218
2270 Trumble Road, Perris

Name	Signature	Entity	Title	Email	Telephone
Charlie Bachmann		EMWD	Assistant General Manager	bachmannc@emwd.org	(951) 928-3777 x_____
Jim Blanke		RMC	Senior Hydrogeologist	jblanke@rmcwater.com	(916) 999-8762
Frank Coate		Soboba Tribe	Natural Resource Manager / Water	fcoate@soboba-nsn.gov	(951) 663-8332
John Daverin		EMWD	Senior Engineering Geologist	daverinj@emwd.org	(951) 928-3777 x4584
John Dotinga		EMWD	Water Production Manager	dotingaj@emwd.org	(951) 928-3777 x7301
Khos Ghaderi		EMWD	Director of Water Operations	ghaderik@emwd.org	(951) 928-3777 x_____
Mike Gow		LHMWD	Asst. General Manager, Chief Engineer	mgow@lhmwd.org	(951) 658-3241 x238
Al Javier		EMWD	Environmental Services Manager	javiera@emwd.org	(951) 928-3777 x6327
Jayne Joy		EMWD	Director, Environ. & Regulatory Compliance	joyj@emwd.org	(951) 928-3777 x_____
Nick Kanetis	present	EMWD	Deputy General Manager	kanetisn@emwd.org	(951) 928-3777 x_____
Kenneth McLaughlin		Soboba Tribe	Director of Public Works	kmclaughlin@soboba-nsn.gov	(951) _____-_______
Erick Miller		Soboba Tribe (Aspect Consulting)	Senior Associate Hydrogeologist	emiller@aspectconsulting.com	(206) 780-7715
Behrooz Mortazavi		Watermaster	Advisor	behrooz@H2Oengineers.com	(714) 794-5520
Gordon Ng		EMWD	Civil Engineering Associate I	ngg@emwd.org	(951) 928-3777 x4512
Brian Jack Powell		EMWD	Director of Planning	powellb@emwd.org	(951) 928-3777 x4278
Ali Taghavi		RMC	Principal	ataghavi@rmcwater.com	(916) 999-8760
Tom Wagoner		LHMWD	General Manager	twagoner@lhmwd.org	(951) 658-3241 x240
MIKE NUSSER		EMWD	WATER RESOURCES PLANNING MANAGER	NUSSERM@EMWD.ORG	x4514
Jeff Wall		EMWD	AGM/O&M	wallj@emwd.org	x6255
Nick Kanetis		EMWD	DGM	kanetisn@emwd.org	x6161
Ryan Brownlee	by phone	Soboba Tribe Aspect Consulting		rbrownlee@aspectconsulting.com	

Meeting Sign-In Sheet

RMC water and environment

EMWD Canyon Operating Plan Project

Subject: 5th Monthly Meeting

Date/Time: June 23rd 2014, 2 pm – 3:30 pm

Location: EMWD, Room 218
2270 Trumble Road, Perris

Name	Signature	Entity	Title	Email	Telephone
Charlie Bachmann		EMWD	Assistant General Manager	bachmannc@emwd.org	(951) 928-3777 x_____
Jim Blanke		RMC	Senior Hydrogeologist	jblanke@rmcwater.com	(916) 999-8762
Frank Coate	present	Soboba Tribe	Natural Resources Manager/Water	fcoate@soboba-nsn.gov	(951) 663-8332
John Daverin		EMWD	Senior Engineering Geologist	daverinj@emwd.org	(951) 928-3777 x4584
John Dotinga		EMWD	Water Production Manager	dotingaj@emwd.org	(951) 928-3777 x7301
Khos Ghaderi		EMWD	Director of Water Operations	ghaderik@emwd.org	(951) 928-3777 x_____
Mike Gow	Present	LHMWD	Asst. General Manager, Chief Engineer	mgow@lhmwd.org	(951) 658-3241 x238
Al Javier		EMWD	Environmental Services Manager	javiera@emwd.org	(951) 928-3777 x6327
Jayne Joy		EMWD	Director, Environ. & Regulatory Compliance	joyj@emwd.org	(951) 928-3777 x_____
Nick Kanetis	present	EMWD	Deputy General Manager	kanetisn@emwd.org	(951) 928-3777 x6161
Kenneth McLaughlin		Soboba Tribe	Director of Public Works	kmclaughlin@soboba-nsn.gov	(951) _____-_______
Erick Miller	present	Soboba Tribe (Aspect Consulting)	Senior Associate Hydrogeologist	emiller@aspectconsulting.com	(206) 780-7715
Behrooz Mortazavi		Watermaster	Advisor	behrooz@H2Oengineers.com	(714) 794-5520
Gordon Ng		EMWD	Civil Engineering Associate I	ngg@emwd.org	(951) 928-3777 x4512
Mike Nusser		EMWD	Water Resources Planning Manager	nusserm@emwd.org	(951) 928-3777 x4514
Brian Jack Powell		EMWD	Director of Planning	powellb@emwd.org	(951) 928-3777 x4278
Ali Taghavi		RMC	Principal	ataghavi@rmcwater.com	(916) 999-8760
Tom Wagoner	Tom Wagoner	LHMWD	General Manager	twagoner@lhmwd.org	(951) 658-3241 x240
Jeff Wall	present	EMWD	Asst. General Manager, O&M	wallj@emwd.org	(951) 928-3777 x6255
Scott Goldman		RMC	Principal	sgoldman@rmcwater.com	(949) 420-5314

Meeting Sign-In Sheet

RMC water and environment

EMWD Canyon Operating Plan Project

Subject: Participants Comment Meeting

Date/Time: November 18th, 2014, 10 am – noon

Location: EMWD, Room 218
2270 Trumble Road, Perris

Name	Signature	Entity	Title	Email	Telephone
Charlie Bachmann		EMWD	Assistant General Manager	bachmannc@emwd.org	(951) 928-3777 x4461
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John Daverin	[signature]	EMWD	Senior Engineering Geologist	daverinj@emwd.org	(951) 928-3777 x4584
John Dotinga		EMWD	Water Production Manager	dotingaj@emwd.org	(951) 928-3777 x7301
Khos Ghaderi		EMWD	Director of Water Operations	ghaderik@emwd.org	(951) 928-3777 x_____
Mike Gow	telephone	LHMWD	Asst. General Manager, Chief Engineer	mgow@lhmwd.org	(951) 658-3241 x238
Al Javier		EMWD	Environmental Services Manager	javiera@emwd.org	(951) 928-3777 x6327
Jayne Joy		EMWD	Director, Environ. & Regulatory Compliance	joyj@emwd.org	(951) 928-3777 x6241
Nick Kanetis		EMWD	Deputy General Manager	kanetisn@emwd.org	(951) 928-3777 x6161
Kenneth McLaughlin		Soboba Tribe	Director of Public Works	kmclaughlin@soboba-nsn.gov	(951) ______-________
Erick Miller	[signature]	Soboba Tribe (Aspect Consulting)	Senior Associate Hydrogeologist	emiller@aspectconsulting.com	(206) 780-7715
Behrooz Mortazavi		Watermaster	Advisor	behrooz@H2Oengineers.com	(714) 794-5520
Gordon Ng	[signature]	EMWD	Civil Engineering Associate I	ngg@emwd.org	(951) 928-3777 x4512
Mike Nusser		EMWD	Water Resources Planning Manager	nusserm@emwd.org	(951) 928-3777 x4514
Brian Jack Powell	[signature]	EMWD	Director of Planning	powellb@emwd.org	(951) 928-3777 x4278
Ali Taghavi	[signature]	RMC	Principal	ataghavi@rmcwater.com	(916) 999-8760
Tom Wagoner	telephone	LHMWD	General Manager	twagoner@lhmwd.org	(951) 658-3241 x240
Jeff Wall	[signature]	EMWD	Asst. General Manager, O&M	wallj@emwd.org	(951) 928-3777 x6255
TIM FLYNN	[signature]	Soboba (Aspect Consulting)	Principal Hydrogeologist	tflynn@aspectconsulting.com	206-780-7730

Appendix C - Example Net Production Calculation

The following is an example of how to calculate Net Production using hypothetical groundwater elevations, based on the steps included in Section 6.4.2.2.

- Hypothetical measured groundwater elevations, recorded April 1:
  - **DW-03: 1529.9’**
  - **Cienega 6: 1520.1’**
  - **LHMWD 16: 1569.0’**
- For each of the three wells, convert the elevation data into a Planning Storage Estimate by using the linear regression formula identified of the Planning Storage Curve figure in Section 6.2. The groundwater elevation would be inserted as “x” and the Planning Storage would be the result, “y”.
  - **DW-03: y = (222.01*1529.9) – 125,286 = 214,367 AF**
  - **Cienega 6: y = (219.66*1520.1) – 120,544 = 213,361 AF**
  - **LHMWD 16: y = (350.31*1569.0) – 342,312 = 207,324 AF**
- Develop a weighted average of the resulting Planning Storage estimates. Add the estimate for Cienega 6, LHMWD 16, and two times the estimate for DW-03. Then, divide the estimate by four.
  - $\boldsymbol{Planning\ Storage = \frac{(214{,}367*2)+213{,}361+207{,}324}{4} = 212{,}355\ AF}$
- Identify the trigger level.
  - If the Planning Storage estimate is greater than 225,000 AF, then there is unrestricted groundwater production as related to this Plan.
  - If the Planning Storage estimate is between 215,000 and 225,000 AF, the basin is within the Proactive trigger.
  - **If the Planning Storage estimate is between 205,000 and 215,000 AF, the basin is within the Responsive trigger.**
  - If the Planning Storage estimate is between 197,000 and 205,000 AF, the basin is within the Near-Critical trigger.
  - If the Planning Storage less than 197,000 AF, the basin is within the Critical trigger.

  - **Trigger level is Responsive**
- Identify the trigger action.
  - Proactive trigger.

$$Basinwide\ Net\ Production = 10{,}100 - \left(\frac{225{,}000 - Planning\ Storage}{10}\right)$$

  - **Responsive and Near-Critical triggers.**

$$\boldsymbol{Basinwide\ Net\ Production = 10{,}100 - \left(\frac{225{,}000 - Planning\ Storage}{4}\right)}$$

  - Critical trigger.
    No Net Production by LHMWD and EMWD within the Canyon Sub-Basin, subject to certain limitations discussed in Subsection 6.3.3.5.

- **Trigger action:** $\boldsymbol{Basinwide\ Net\ Production = 10,100 - \left(\frac{225,000-212,355}{4}\right) = 6,939\ AFY}$

- Estimate groundwater production by the Soboba Tribe and private pumpers by using the average of the past five-years. Subtract this value from the Basinwide Net Production to identify the volume available to EMWD and LHMWD.
  - **Hypothetical average production over the past five years, Soboba Tribe: 1,100 AFY**
  - **Hypothetical average production over the past five years, private pumpers: 489 AFY**

  - **Net Production available to EMWD and LHMWD = 6,939 – (1,100+489) = 5,350 AFY**
- Coordinate with EMWD and LHMWD to identify individual actions to meet the Basinwide Net Production levels. EMWD and LHMWD will coordinate to develop these actions and to define cost sharing, which will be based on the level of benefits received.

Prepared by:

RMC
water and environment

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