ANNUAL GROUNDWATER CONDITIONS REPORT
FOR THE
AGUA CALIENTE INDIAN RESERVATION

Water Year 2020

Prepared for:
Agua Caliente Water Authority
Agua Caliente Band of Cahuilla Indians

Prepared by:
Stetson Engineers Inc.
April 2021

Executive Summary

This Groundwater Conditions Report (Report) presents the current and historical conditions of the resources managed by the Agua Caliente Water Authority (ACWA), which is authorized by Tribal Ordinance No. 55 to manage the proper use of the groundwater resources of the Agua Caliente Band of Cahuilla Indians (ACBCI or Tribe). The Report summarizes the physical and administrative conditions of the Tribe's groundwater resources during Water Year[1] (WY) 2020 in addition to providing historical background.

Total rainfall at the Palm Springs precipitation gage during WY 2020 was 7.4 inches, which is greater than the long-term average of 5.5 inches. Conversely, streamflow at Palm Canyon, Tahquitz Creek, and Murry Canyon was less than the long-term average. The difference in rainfall versus streamflow is typical in desert environments where the precipitation on the valley floor does not necessarily reflect runoff. Runoff and measured streamflow therefore have a more direct impact on groundwater resources and better reflect the hydrologic conditions that occurred on the Agua Caliente Indian Reservation (ACIR or Reservation).

Monitoring and reporting of both groundwater levels and water quality are key components of this Report and are also used to describe hydrologic conditions. Both groundwater levels and water quality are affected by recharge, pumping, and other anthropogenic activities, and depict the actual conditions that exist during their period of measurement. Overall, the net quantity of groundwater in storage beneath the Reservation increased during WY 2020 compared to WY 2019. While the Rancho Mirage area saw a small decrease in groundwater storage, there was a greater positive change in storage in the northern portion of the Reservation. Water quality, as measured by total dissolved solids (TDS), did not show any significant changes when compared to WY 2019.

Based on the most recently available data, Coachella Valley Water District (CVWD) and Desert Water Agency (DWA) pumped a combined total of 9,392 acre-feet (AF) of water from wells located on the Reservation during the 2018 calendar year. While this pumping occurred two years prior to the period of this Report, their groundwater production reflects an overall decreasing trend since 1988, when pumping on the reservation in the CVWD and DWA service areas reached its peak of nearly 50,000 AF. The lag between CVWD's and DWA's reported pumping and the period of record covered in this Report is considered a data gap that will be addressed in next year's WY 2021 Groundwater Conditions Report.

CVWD and DWA released 47,500 AF of water from the Colorado River Aqueduct (CRA) at the Whitewater River Replenishment Facility (WRRF) during WY 2020. This quantity represented a significant decrease in recharge from WY 2018 and WY 2019 when releases were

[1] Water Year occurs from October 1st of the previous year to September 30th of the current year.

247,812 and 213,380 AF, respectively. Releases of CRA water at the WRRF affect both groundwater in storage and water quality beneath the Reservation. Water management activities by the two districts directly affect Tribal resources and will continue to be monitored and reported in the future.

Two threats to Tribal resources include both loss of groundwater in storage and degradation of water quality. Current management activities by CVWD, DWA, and other water and wastewater purveyors in the Coachella Valley include sustainable groundwater management and salt and nutrient management activities. Under California's recently passed Sustainable Groundwater Management Act (SGMA), the Indio Subbasin Groundwater Sustainability Agency (GSA) was formed. The GSA submitted an Alternative Groundwater Sustainability Plan (GSP) in 2017, which requires an update by January 2022. The goal of the GSP for the Indio Subbasin is to provide a long-term plan for the basin to reach sustainable groundwater production that does not negatively impact groundwater in storage or water quality. The Tribe is currently participating as a stakeholder in the GSP process.

CVWD, DWA, and other water and wastewater purveyors are also developing a Salt and Nutrient Management Plan (SNMP) for the Coachella Valley. During WY 2020, the SNMP stakeholders worked with the Regional Water Quality Control Board (RWCQB) to develop a monitoring plan and schedule for completing the SNMP. While the monitoring plan was submitted to the RWQCB in December 2020, the actual SNMP for managing the basin is not expected until WY 2025 or later. Similar to participating in the update to the Alternative GSP, the Tribe is currently participating as a stakeholder in the SNMP process.

This Report is the second Annual Groundwater Conditions Report for ACIR. Data gaps in water quantity and water quality monitoring are currently being identified and will be addressed in the WY 2021 Report. Threats to the Tribe's groundwater resources have been identified as loss of groundwater storage and degradation of water quality. Additional data and management activities that impact these threats will be included in future versions of this Report as they become available.

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List of Acronyms

ACBCI ..... Agua Caliente Band of Cahuilla Indians
ACIR ..... Agua Caliente Indian Reservation
ACWA ..... Agua Caliente Water Authority
AF ..... Acre-Feet
AFY ..... Acre-Feet per Year
amsl ..... Above mean sea level
bgs ..... Below ground surface
CDM ..... Cumulative Departure from Mean
cfs ..... Cubic Feet per Second
COC ..... Constituent of Concern
CRA ..... Colorado River Aqueduct
CSD ..... Coachella Sanitary District
CVWD ..... Coachella Valley Water District
CWA ..... Coachella Water Authority
DTW ..... Depth to Water
DWA ..... Desert Water Agency
DWR ..... Department of Water Resources
ft ..... Feet
GIS ..... Geographic Information Systems
GPP ..... Groundwater Production Permit
GSE ..... Ground Surface Elevation
GSA ..... Groundwater Sustainability Agency
GSP ..... Groundwater Sustainability Plan
HOA ..... Home Owners Association
in. ..... Inches
IWA ..... Indio Water Authority
MA ..... Management Area
MDMWC ..... Myoma Dunes Mutual Water Company
mg/L ..... Milligram per Liter
MSWD ..... Mission Springs Water District
NCDC ..... National Climatic Data Center
NCEI ..... National Center for Environmental Information
RAWS ..... Remote Automated Weather Station

RWQCB ..... Regional Water Quality Control Board
SGMA ..... Sustainable Groundwater Management Act
SNMP ..... Salt and Nutrient Management Plan
SWP ..... State Water Project
SWRCB ..... State Water Resources Control Board
TDS ..... Total Dissolved Solids
µg/L ..... Microgram per liter
USGS ..... United States Geological Survey
UWMP ..... Urban Water Management Plan
VSD ..... Valley Sanitary District
WQO ..... Water Quality Objective
WRCC ..... Western Regional Climate Center
WRF ..... Water Reclamation Facility
WRRF ..... Whitewater River Replenishment Facility
WSE ..... Water Surface Elevation
WY ..... Water Year

Section 1: Introduction and Background

1.1 Introduction

The Agua Caliente Indian Reservation (ACIR or Reservation) is located in and adjacent to the cities of Palm Springs, Cathedral City, and Rancho Mirage in Riverside County, California (Figure 1-1). The Reservation encompasses over 31,500 acres and contains numerous seasonal and perennial creeks, hot and cold water springs, and a vast supply of groundwater. The Reservation extends into the San Jacinto Mountains to the west, the foothills of the Santa Rosa and southern San Jacinto Mountains to the south, the Whitewater River floodplain to the north, and the cities of Cathedral City and Rancho Mirage to the east. The Reservation is situated within the Indio Subbasin of the Coachella Valley Groundwater Basin, as designated in California Department of Water Resources (DWR) Bulletin 118 (DWR, 2016). The Indio Subbasin is further subdivided into two management areas (MAs): the West Whitewater MA and the East Whitewater MA. The ACIR is located within the West Whitewater MA.

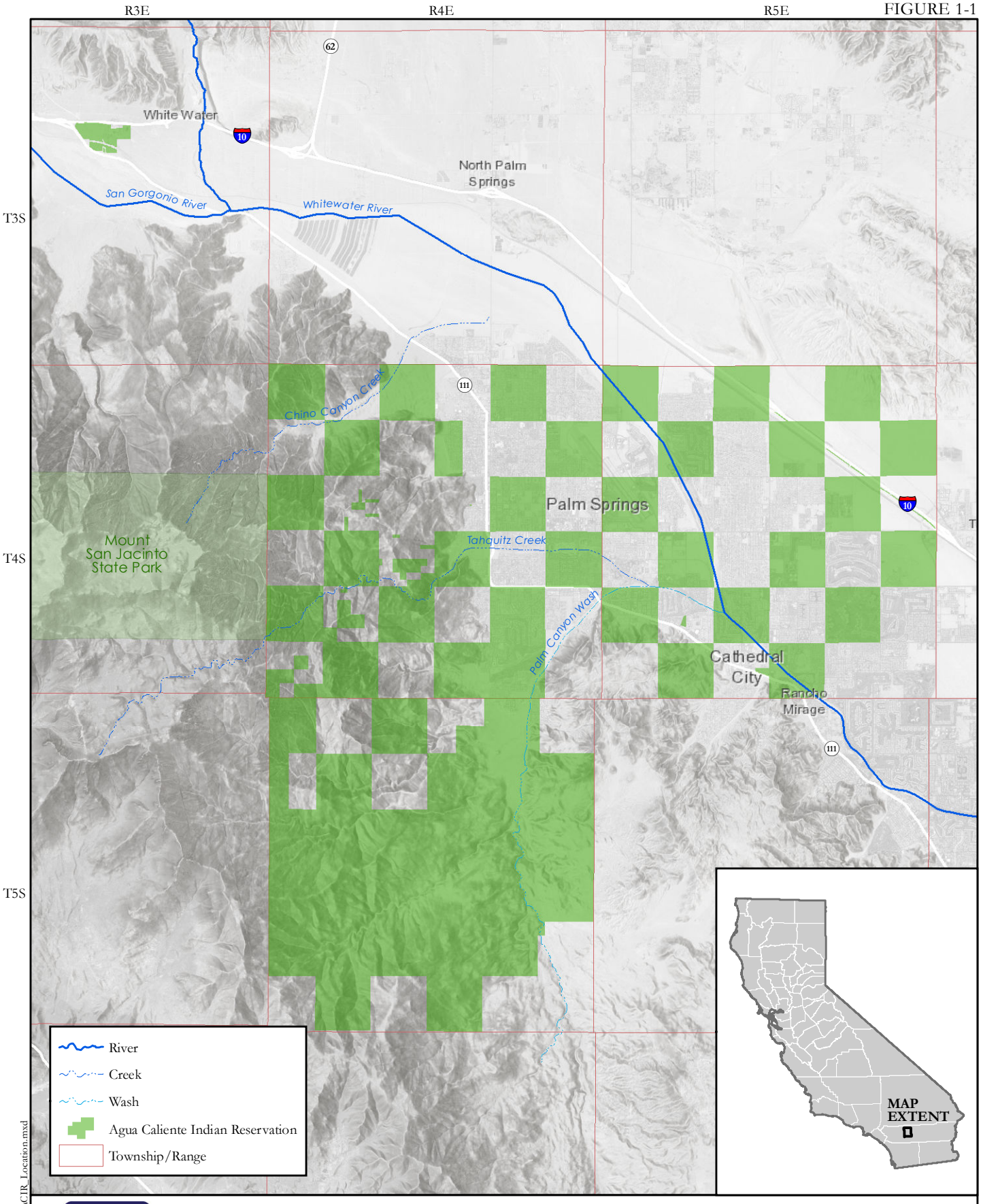
The Agua Caliente Band of Cahuilla Indians (ACBCI or Tribe) Planning and Development Department (Department) has monitored groundwater quality and quantity conditions on the Reservation since 1999. The summary of groundwater conditions in this report is based on this historical water monitoring data collected and produced by the Department as well as data collected by other agencies such as the United States Geological Survey (USGS) or submitted to the Tribe from the Coachella Valley Water District (CVWD) and the Desert Water Agency (DWA). Data in this report is presented on a water year (WY) basis, which begins on October 1st of the previous year and ends on September 30th of the current year.

1.2 Administrative Background

The Agua Caliente Water Authority (ACWA) is organized and operates pursuant to the ACWA Ordinance No. 55 (Ordinance 55), which is enacted under the inherent sovereign authority of the Tribe and pursuant to sections (a), (b), (d), (e), (f), (g), (i), and (o) of Article V of the Tribe's Constitution, as well as pursuant to any applicable delegations of federal authority to the Tribe under federal law.

The power to manage the proper uses of the Tribe's groundwater is an essential attribute of tribal sovereignty. The ACWA was created as a governmental instrumentality, which can, among other things, administer well permits, monitor and manage groundwater levels and groundwater quality, and administer the imposition of groundwater production fees on users of the Tribe's groundwater, including on Non-Tribal Water Agencies, operating groundwater producing facilities within the ACIR.

FIGURE 1-1



AGUA CALIENTE INDIAN RESERVATION COACHELLA

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Groundwater production fees are required to support ACWA's protection and management of groundwater supplies for users within the Reservation, which is necessary for the public health, welfare, and safety of the Tribe, its tribal members, and the larger Coachella Valley community. In connection with the establishment and levying of such charges, Chapter II, Section H of Ordinance 55 provides that "the Water Authority Board shall prepare a report regarding groundwater conditions, production, and use within the Reservation."

This Annual Groundwater Conditions Report (Report) is provided to the ACWA Board to assist in evaluating the nature of groundwater conditions, the costs associated with operating ACWA, as well as the Tribe's permitting and groundwater monitoring programs, the market conditions for groundwater in the area, and the groundwater production fees to be levied by non-Tribal water agencies in the West Whitewater MA for the following fiscal year.

A comprehensive monitoring network is necessary for ACWA to fulfill its responsibility to protect Reservation groundwater supplies. DWA and CVWD have production and monitoring wells scattered throughout the Reservation. Data from these wells regarding groundwater levels and quality, which the ACWA anticipates obtaining through the various provisions of the Water Ordinance, will provide valuable information regarding the conditions of groundwater under the Reservation.

1.3 Basin Planning Activities

Basin planning activities address requirements imposed on non-tribal water and wastewater purveyors by the State of California to maintain and manage a sustainable water source for all residents of the Coachella Valley. As the major groundwater producers and importer of surface water, many of the activities are led by CVWD and DWA in cooperation with other local water districts and stakeholders. In addition to the studies described below, water purveyors develop Urban Water Management Plans (UWMPs) every five years that describe water supply, demand, and planning activities.[2]

1.3.1 Sustainable Groundwater Management Act

The State of California passed the Sustainable Groundwater Management Act (SGMA) in 2014 to provide a framework for sustainable management of the state's groundwater basins. As part of SGMA, local agencies are required to form a Groundwater Sustainability Agency (GSA) to develop a Groundwater Sustainability Plan (GSP) to achieve long-term sustainability. Based on existing groundwater management activities, GSAs have the option to provide an Alternative Plan in lieu of a GSP. Regardless of the development of either a GSP or Alternative Plan, the plan must demonstrate that the basin is likely to achieve sustainability within 20 years.

[2] UWMPs for CVWD and DWA may be downloaded from their respective websites.

The Coachella Valley Groundwater Basin consists of the Indio, Mission Creek, San Gorgonio Pass, and Desert Hot Springs Subbasins. Three of these basins were designated by DWR as medium priority, while the Desert Hot Springs Subbasin was designated as a very low priority subbasin. The priority classification of the basin determines the required timing for submitting a GSP to achieve sustainability; January 2020 for critically overdrafted basins and January 2022 for non-critical basins. GSAs that submit an Alternative Plan based on existing groundwater management plans were required to do so by January 2017.

The Indio Subbasin GSA is collectively managed by CVWD, Coachella Water Authority (CWA), DWA, and Indio Water Authority (IWA). On December 29, 2016, the Indio Subbasin GSA submitted an Alternative Plan for achieving sustainability based on existing groundwater management plans that include the 2010 Coachella Valley Water Management Plan (CVWD, 2012) and a Bridge Document (CVWD, 2016). The Alternative Plan submitted by the Indio Subbasin GSA was approved by DWR in July 2019.

Presently, the Indio Subbasin GSA is preparing a Plan Update that is due in January 2022. The Plan Update is intended to assess the efficacy of the 2010 Coachella Valley Water Management Plan and provide recommendations for achieving sustainability within the 20-year time frame allotted by DWR. Additionally, the Indio Subbasin GSA is required to submit annual reports that support the Alternative Plan. There have been four annual reports submitted to DWR for WY 2017 through WY 2020.

1.3.2 Salt and Nutrient Management Plan

The State of California's Recycled Water Policy requires the preparation of Salt and Nutrient Management Plans (SNMP) to manage salts and nutrients on a basin-wide scale. Originally adopted by the State Water Resources Control Board (SCWRB) in 2013, the intent of developing and SNMP is to manage basin salts and nutrients while promoting recycled water use. In June 2015, CVWD, DWA, and IWA submitted the Coachella Valley Groundwater Basin SNMP to the Colorado River Basin Regional Water Quality Control Board (RWQCB) in compliance with State Resolution No. 2013-0003.

The RWQCB subsequently rejected the 2015 SNMP in August of 2015 citing numerous deficiencies including omission of Water Quality Objectives, assessment of Ambient Water Quality, and determination of assimilative capacity. In addition to other deficiencies cited by the RWQCB in August 2015, the need for a comprehensive monitoring plan to characterize the water quality of the basin was emphasized to assess the plan's omissions.

The SNMP Agencies for the Coachella Valley SNMP, which include CVWD, CWA and Coachella Sanitary District (CSD), DWA, and IWA, Myoma Dunes Mutual Water Company (MDMWC), Valley Sanitary District (VSD), Mission Springs Water District (MSWD), and the City of Palm Springs, submitted the Groundwater Monitoring Program Workplan for the

Coachella Valley Salt and Nutrient Management Plan Update (Work Plan) in December 2020. The Work Plan addresses deficiencies identified by the RWQCB specific to basin characterization, data gaps, and ongoing monitoring specific to developing a final SNMP. Although a specific date has not been proposed by the SNMP Agencies for completion of a final SNMP, the expected timeframe for completion is by WY 2025 to WY 2027.[3]

1.4 Tribe's Water Rights

The purpose of this section is to identify the various water rights held by the ACIR and not to provide opinion as to their quantification, current use, or ongoing litigation; nor is this section intended to represent a comprehensive and complete list of Tribe's surface and groundwater rights. The Tribe holds federal reserved water rights to groundwater in the Coachella Valley as affirmed by the 9th Circuit Court of Appeals as described in its March 7, 2017 opinion. The Tribe has claimed additional diversions from the Whitewater River at Whitewater Ranch, in the amount of 3.75 cfs. Additionally, the Tribe holds State of California surface water rights to the Whitewater River consistent with the 1938 Whitewater River Decree.[4]

[3] Expected timeframe based on verbal communication during SNMP work group meetings.

[4] Surface water rights are located on Tahquitz and Andreas Creeks.

Section 2: Climate and Hydrology

2.1 Climate

Precipitation and temperature are key climatological data that impact both surface and groundwater resources. There are several weather stations located on and around the Reservation which can be used to evaluate climatic conditions in the area. The Palm Springs station has the longest continuous period of record and is located most central to the Reservation at the Palm Springs Airport, at an elevation of 425 feet (ft). The Cathedral Canyon station is located at the southeast end of the Reservation at an elevation of 605 ft, near Cathedral City, which is typically drier than elsewhere on the ACIR. The Whitewater station[5] is located near the Colorado River Aqueduct (CRA) discharge facility at an elevation of 2,546 ft, northwest of the Reservation. The Whitewater station is most representative of natural precipitation recharge to the Reservation. Monthly precipitation during WY 2020 at each of these stations is shown in Table 2-1. The maximum monthly precipitation at the Palm Springs, Cathedral Canyon, and Whitewater stations was 2.75 inches (in.), 0.63 in., and 3.03 in., respectively, occurring during the winter months. Total precipitation at the Palm Springs station was 7.37 in., compared to 1.66 in. at Cathedral Canyon and 8.67 in. at Whitewater.

TABLE 2-1. TOTAL MONTHLY PRECIPITATION AT SELECTED STATIONS, WY 2020 (IN.)

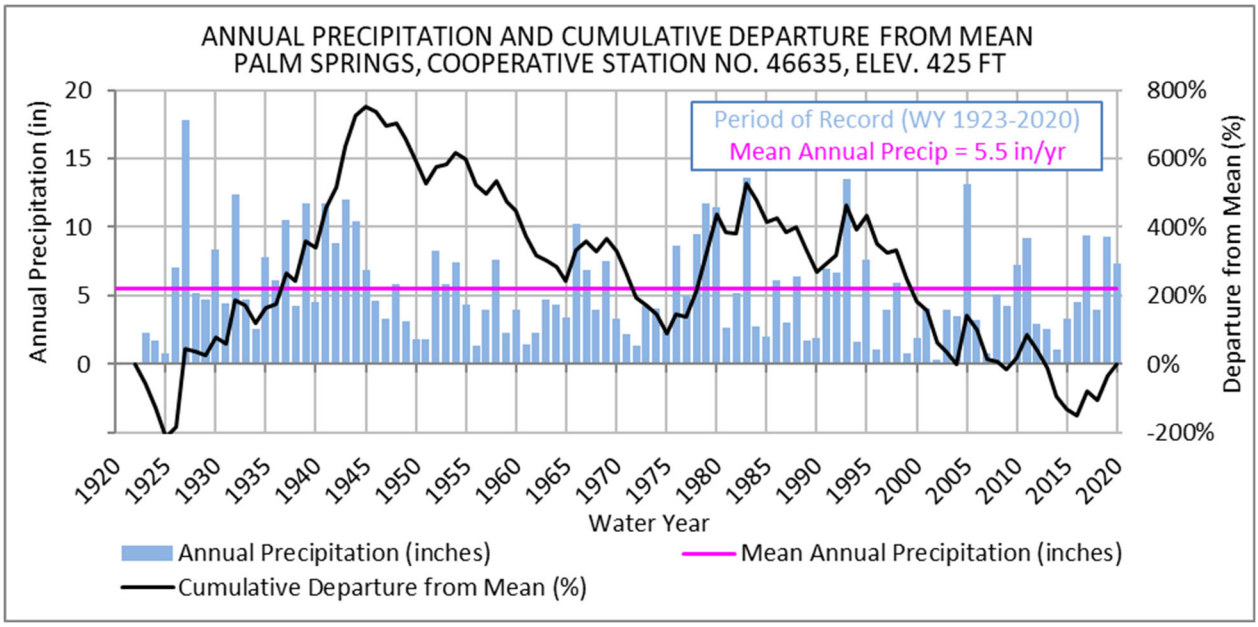
	Station Name		
Month	**Palm Springs[/a]** (elev. 425 ft)	**Cathedral Canyon[/b]** (elev. 605 ft)	**Whitewater[/b]** (elev. 2,546 ft)
Oct	0.00	0.00	0.00
Nov	1.06	0.63	1.77
Dec	1.98	0.46	2.59
Jan	0.04	0.05	0.01
Feb	0.00	0.00	0.13
Mar	2.75	0.36	3.03
Apr	1.54	0.16	1.12
May	0.00	0.00	0.00
Jun	0.00	0.00	0.02
Jul	0.00	0.00	0.00
Aug	0.00	0.00	0.00
Sep	0.00	0.00	0.00
Total	**7.37**	**1.66**	**8.67**

Notes: a) Source: Western Regional Climate Center (WRCC) National Centers for Environmental Information (NCEI) Coop Station data (WRCC, 2021a).
b) Source: WRCC Remote Automatic Weather Station (RAWS) data (WRCC, 2021b).

[5] The Whitewater precipitation station is referred to by the WRCC as White Water.

The continuous period of record at the Palm Springs station is shown in Figure 2-1, along with the average annual precipitation and a cumulative departure from mean (CDM) curve, which shows long-term trends in precipitation. A positive slope in the CDM curve indicates a wetter than average period, while a negative slope indicates a drier than average condition. In recent years, the CDM curve shows an extended dry period from WY1993 through WY 2016; WY 2017 through WY 2020 were wetter than average.

FIGURE 2-1. PRECIPITATION AND CUMULATIVE DEPARTURE FROM MEAN AT PALM SPRINGS



Monthly temperature data from the Palm Springs weather station for WY 2020 is shown in Table 2-2 (NCEI, 2021). The average high, maximum, average low, minimum, and overall average temperature are shown for each month. The maximum temperature recorded was 122°F, in July and September 2020. The lowest temperature recorded was 38°F, in December 2019 and February 2020. Throughout WY 2020, the average high temperature was 90°F, and the average low temperature was 63°F.

TABLE 2-2. MONTHLY TEMPERATURE AT PALM SPRINGS (°F)

Month	Average High	Maximum	Average Low	Minimum
Oct	90	102	62	45
Nov	81	95	54	41
Dec	67	75	47	38
Jan	73	82	47	41
Feb	76	89	49	38
Mar	74	87	52	44
Apr	86	106	60	49
May	100	111	69	61
Jun	103	115	73	65
Jul	112	122	79	72
Aug	112	120	83	71
Sep	108	122	77	68
Annual	**90**[/a]	**122**[/b]	**63**[/a]	**38**[/c]

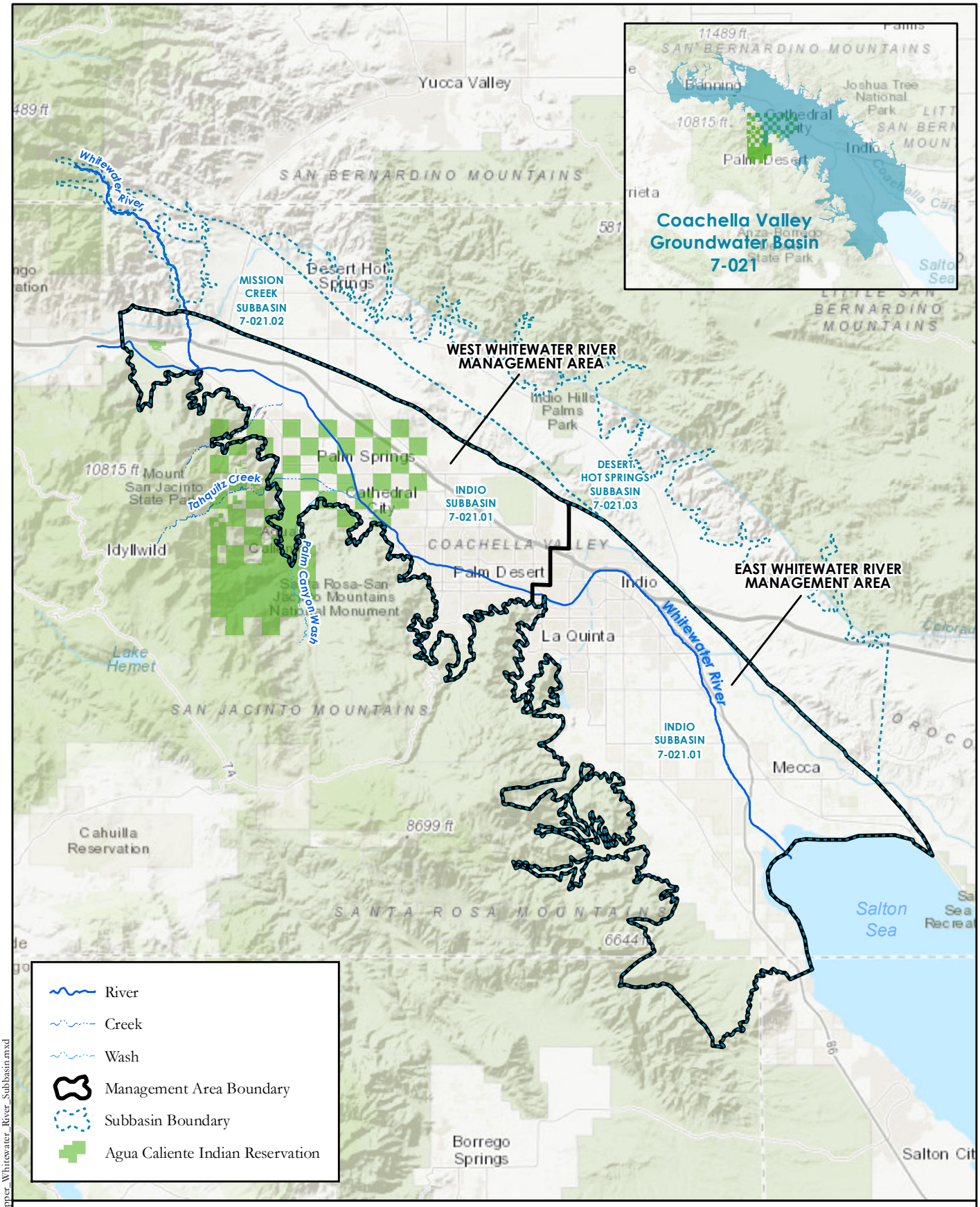
Notes: a) Annual average of statistic.
b) Maximum annual value of statistic.
c) Minimum annual value of statistic.

2.2 Natural Hydrology

The Reservation lies within the Indio Subbasin, which is also referred to as the Whitewater Subbasin by USGS. The basin begins in the northwest near the junction of State Highway 111 and Interstate Highway 10, and continues southeast to the Salton Sea. It is bounded on the north and northeast by the Garnet Hill and San Andreas faults, both of which are considered effective groundwater barriers. It is bounded on the south and southwest by the San Jacinto and Santa Rosa mountain ranges. It includes the vast majority of the Coachella Valley basin floor and encompasses 400 square miles. The Indio Subbasin has been further divided into the West and East Whitewater MAs as defined by CVWD and DWA (CVWD, 2020; DWA, 2020). A portion of the Reservation lies within the West Whitewater MA (Figure 2-2).

The ACIR includes area in the foothills of the San Jacinto Mountains as well as land on the valley floor (Figure 2-2). USGS operates the National Streamflow Network which consists of stream gages that continuously monitor streamflow year-round, and from which average and total streamflow is computed. The USGS continuously measures streamflow at 20 locations in the Indio Subbasin, all of which are listed and plotted in Table 2-3 and Figure 2-3, respectively, along with the total flow recorded in WY 2020 at each station (USGS, 2021). A large difference in annual flows is evident at different stations along the main channel of the Whitewater River.

FIGURE 2-2



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INDIO SUBBASIN
WEST AND EAST WHITEWATER RIVER MANAGEMENT AREAS
COACHELLA VALLEY GROUNDWATER BASIN

0 2.5 5 Miles

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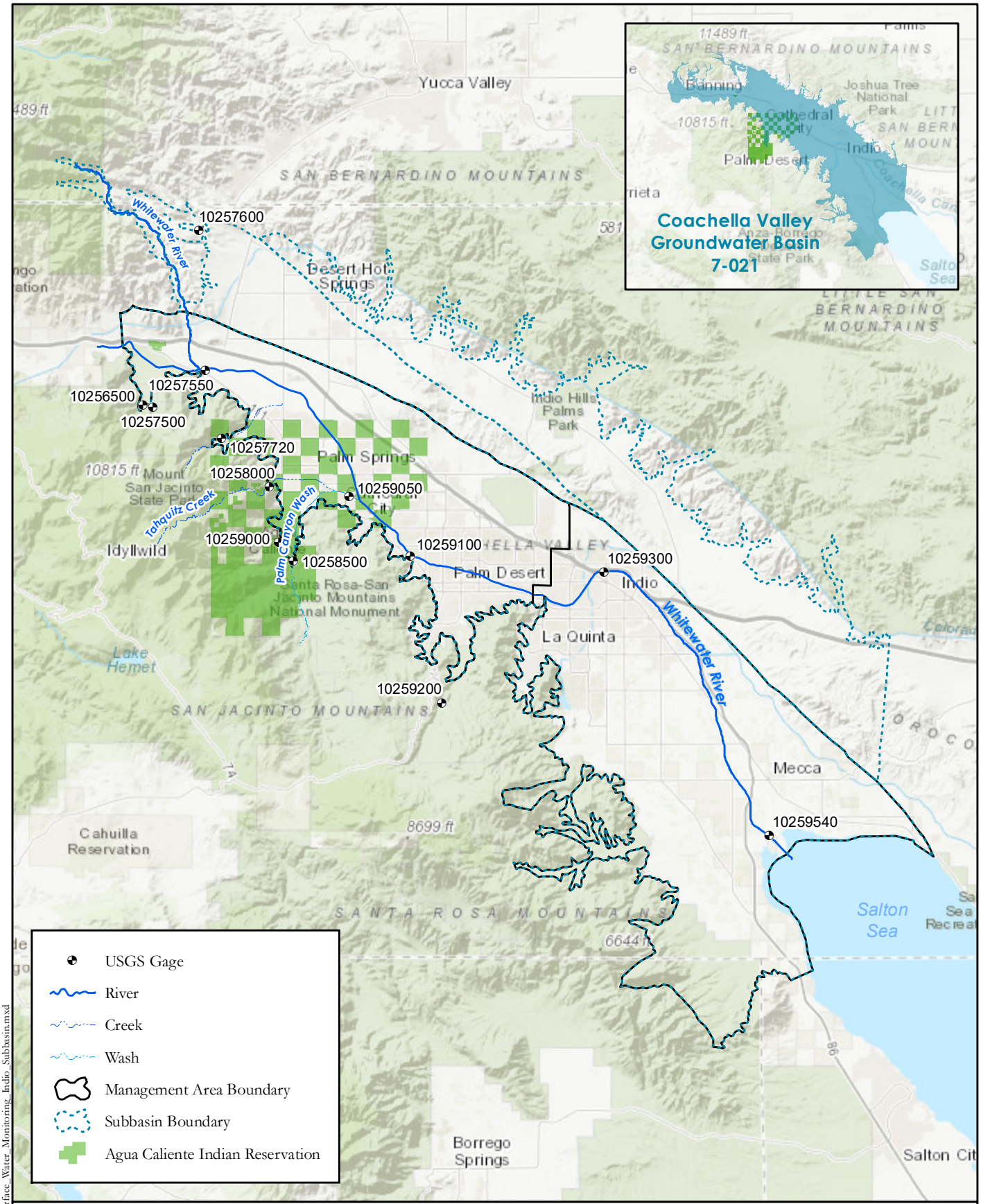
TABLE 2-3. USGS STREAM GAGES IN THE INDIO SUBBASIN

USGS Gage Number	USGS Gage Name	Drainage Area (square miles)	Period of Record (WY)	Total Annual Flow WY 2020 (AF)
10256500	Snow Creek near Whitewater	10.9	1979-2020	5,206
10257500	Falls Creek near Whitewater	4.14	1923-2020	931
10257550	Whitewater River at Windy Point near Whitewater	264	1985-2020	47,250
10257600	Mission Creek near Desert Hot Springs	37.3	1968-2020	1,227
10257720	Chino Canyon Creek below Tramway near Palm Springs	4.71	1987-2020	607
10258000	**Tahquitz Creek near Palm Springs**	**16.9**	**1948-2020**	**2,877**
10258500	**Palm Canyon Creek near Palm Springs**	**93.1**	**1930-2020**	**1,094**
10258700	**Murray Canyon Creek near Palm Springs**	**8.78**	**2017-2020**	**696**
10259000	**Andreas Creek near Palm Springs**	**8.65**	**1949-2020**	**1,706**
10259050	Palm Canyon Wash near Cathedral City	139	1988-2020	71
10259100	Whitewater River at Rancho Mirage	588	1989-2020	201
10259200	Deep Creek near Palm Desert	30.6	1962-2020	533
10259300	Whitewater River at Indio	1,073	1966-2020	471
10259540	Whitewater River near Mecca	1,495	1961-2020	51,170

Notes: Stream gages in **bold** are located on ACIR.
Whitewater River at Windy Point near Whitewater (#10257550) includes releases from the CRA.

FIGURE 2-3



SURFACE WATER MONITORING IN THE INDIO SUBBASIN COACHELLA VALLEY GROUNDWATER BASIN

0 2.5 5 Miles

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The minimum annual flow recorded in the main channel of the Whitewater River was 201 acre-feet (AF), recorded at Rancho Mirage gage. The maximum annual flow in the main channel of the Whitewater River was 51,170 AF, recorded at the Mecca gage, which is the southeastern terminus of the Whitewater River, where it drains into the Salton Sea. The change in flow along the river is likely due to the management of the basin, in which the majority of flow in the Whitewater River is recharged to the groundwater basin at the northwest end of the basin. As a result, there is very little surface flow until the river reaches the Valley Sanitary District Water Reclamation Facility (WRF), which discharges into the Whitewater River. After this point, WRF discharge and agricultural runoff and return flows contribute to the surface flow of the river until it reaches the Salton Sea.

Four of the USGS gaging stations are located on ACIR: Tahquitz Creek, Palm Canyon Creek, Murray Canyon Creek, and Andreas Creek. Monthly average flow for each during WY 2020 is shown in Table 2-4, in cubic feet per second (cfs).

TABLE 2-4. AVERAGE MONTHLY STREAMFLOW AT SELECTED STATIONS (CFS)

Month	Tahquitz Creek (10258000)	Palm Canyon Creek (10258500)	Murray Canyon Creek (10258700)	Andreas Creek (10259000)
Oct	0.24	0	0	1.87
Nov	0.77	0.19	0.11	2.12
Dec	3.63	1.63	1.42	3.23
Jan	1.96	0.51	0.65	2.32
Feb	2.44	0.39	0.31	2.09
Mar	6.95	5.87	3.20	3.57
Apr	14.9	9.20	4.96	4.63
May	12.1	0.34	0.77	2.68
Jun	3.73	0	0.07	1.85
Jul	0.82	0	0	1.38
Aug	0.01	0	0	1.20
Sep	0	0	0	1.27
WY Average	**3.96**	**1.51**	**0.96**	**2.35**
Long-term Average	**4.81**	**4.71**	**1.73**	**2.75**

Note: Long-term averages are based on 1948-2020 for Tahquitz Creek, 1930-2020 for Palm Canyon Creek, 2017-2020 for Murray Canyon Creek, and 1949-2020 for Andreas Creek.

Section 3: Production and Monitoring Wells

3.1 Production Wells on Reservation Lands

Based on available well logs and data from local agencies, there are 49 production wells located on Reservation lands. Of these, 19 are located on trust land, 5 are on Tribal land, and 25 are on fee land. In addition, 37 of the 49 production wells are known to be active and 12 are of unknown status. 13 production wells have ACWA Groundwater Production Permits (GPPs) with a total face value of 5,461.88 AF (Table 3-1). All known production wells on Reservation lands are shown in Figure 3-1.

TABLE 3-1. PERMITTED PRODUCERS ON ACIR

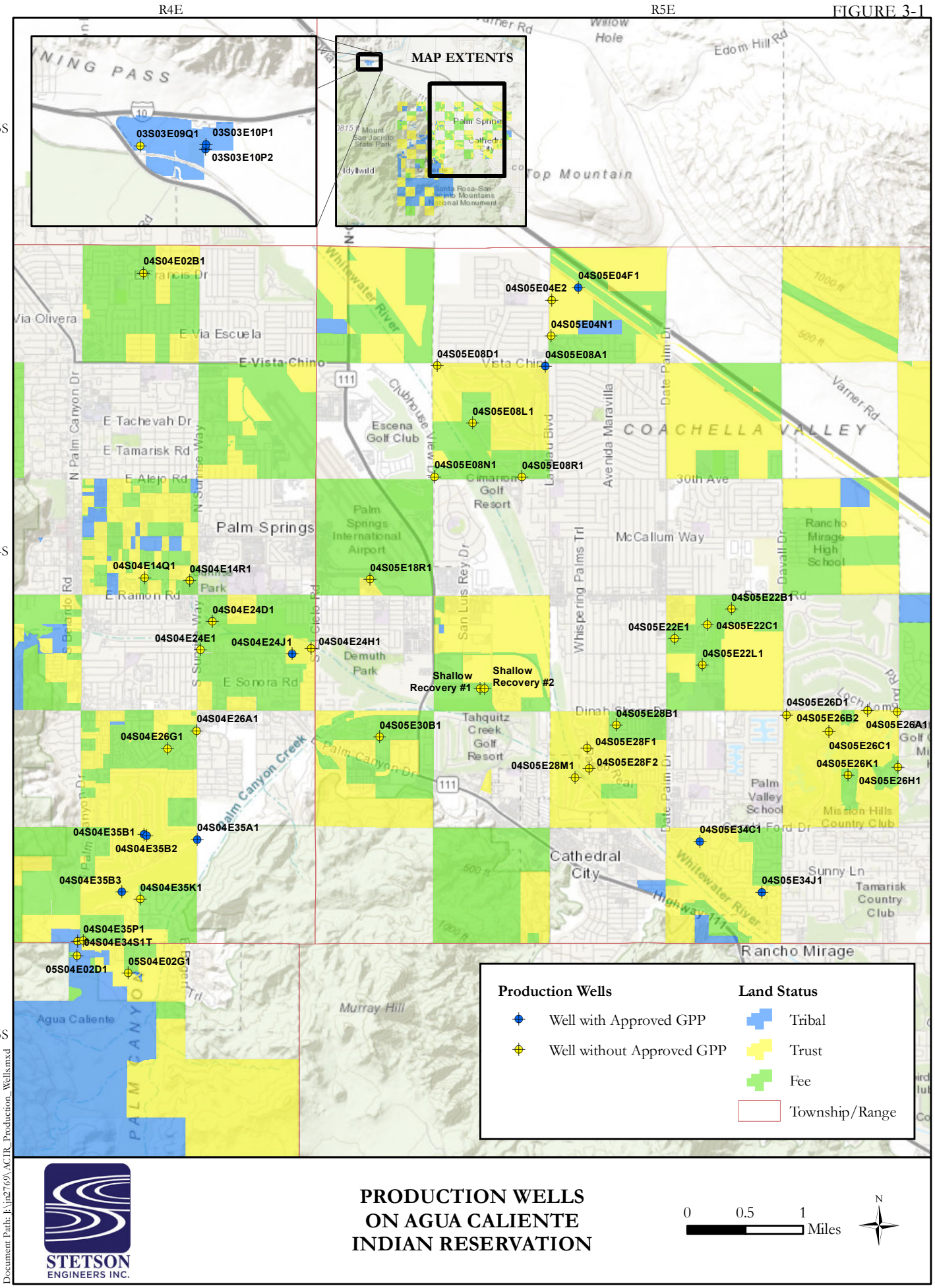
Producer	GPP Number	Well	GPP Status	Permit Face Value (AF)
Whitewater Ranch (ACBCI)	19-05 20-04	03S03E10P1 03S03E10P2	Approved	5 5
Indian Canyon Golf Resort (ACBCI)	20-05 20-09 20-10 20-11	04S04E35A1 04S04E35B1 04S04E35B2 04S04E35B3	Approved	200[a] 600[a] 800 800
Union Pacific Railroad	20-06	04S05E04F1	Approved	500
Date Palm Country Club	20-07 20-08	04S05E34C1 04S05E34J1	Approved	519 470
Desert Princess HOA	20-12	04S05E08A1	Approved	910
Bel Air Greens	20-13	04S04E24J1	Approved	12.88
Cathedral Canyon Country Club		04S05E28F1 04S05E28M1	Under review	1,176-1,260[b] 132-180[b]
		Total Permitted Production		**5,461.88**

Notes: a) Wells used as backup supply for Indian Canyon Golf Resort and are not included in the total permitted production.
b) Range of values calculated based on producer's estimate of monthly production. Upper end of range used in total.

Because the ACWA groundwater permitting process is in its early stages, independent data showing the amount of groundwater produced on the Reservation is not available. Based on data included in DWA's public reporting and CVWD's response to a California Public Records Act Request, at least 9,392 AF of groundwater were produced on the Reservation in 2018 by wells within the DWA and CVWD service areas. Production on the Reservation in these two districts included 4,996 AF pumped in the DWA service area and 4,396 AF pumped in the CVWD service area.[6]

[6] Based on DWA and CVWD records provided to the Tribe via file transfer on August 15, 2019.

FIGURE 3-1



PRODUCTION WELLS ON AGUA CALIENTE INDIAN RESERVATION

0 0.5 1 Miles

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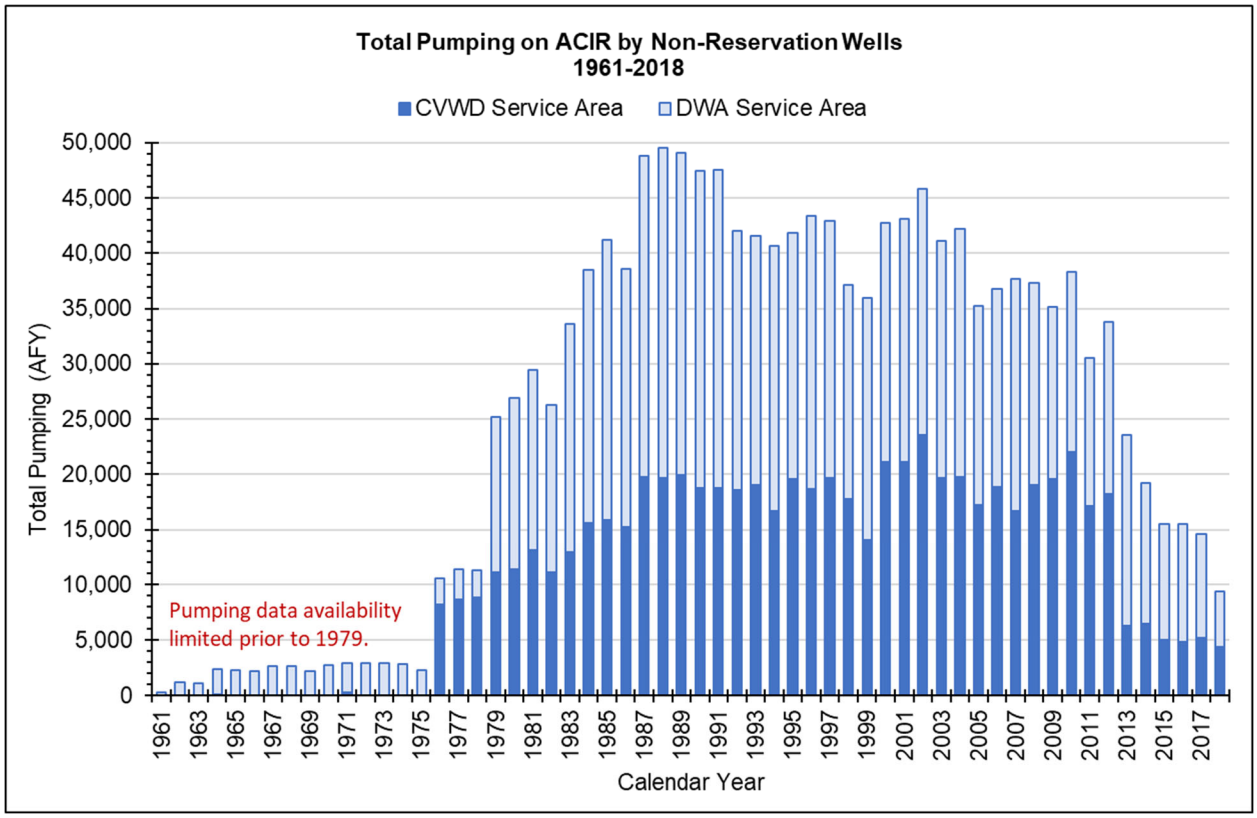
Available production data for wells on ACIR, according to CVWD and DWA records, is shown in Figure 3-2 through 2018. More recent production data for WY 2019 and WY 2020 were not available. Production data available for wells with GPPs is summarized in Appendix A.

FIGURE 3-2. ANNUAL GROUNDWATER PRODUCTION ON ACIR



According to Table 2 of the DWA Engineer's Report for 2020/2021, at least 404 AF was produced on the Reservation by other parties during 2019, not including production by DWA itself (DWA, 2020).[7] This production is not included in Figure 3-2, because it is not a complete representation of groundwater production on the Reservation in 2019. The amount of pumping within CVWD's service area on ACIR is not available because CVWD no longer makes data available showing how much is being produced by specific parties or at specific wells in its service area. Due to the lack of data, actual amounts of groundwater produced on the Reservation is likely much higher than the amounts reported herein based on the limited information currently available to the ACWA. In the future, wells with GPPs will report annual production

[7] 404 AF is the amount of groundwater extraction by: Desert Oasis Golf Management – Welk Resort, Los Compadres Home Association, and Seven Lakes Country Club, which are all producers with known wells on Reservation land.

on a WY basis to ACWA, which will then be included in the Groundwater Conditions Report for the following year.

3.2 Monitoring Wells on Reservation Lands

Based on available well logs and data from local agencies, there are eight monitoring wells located on Reservation lands. Of these, seven are active and located on trust land, and one is inactive and located on fee land. Three monitoring wells have approved ACWA GPPs (Table 3-2). All monitoring wells on Reservation lands are shown in Figure 3-3.

TABLE 3-2. PERMITTED MONITORING WELLS ON ACIR

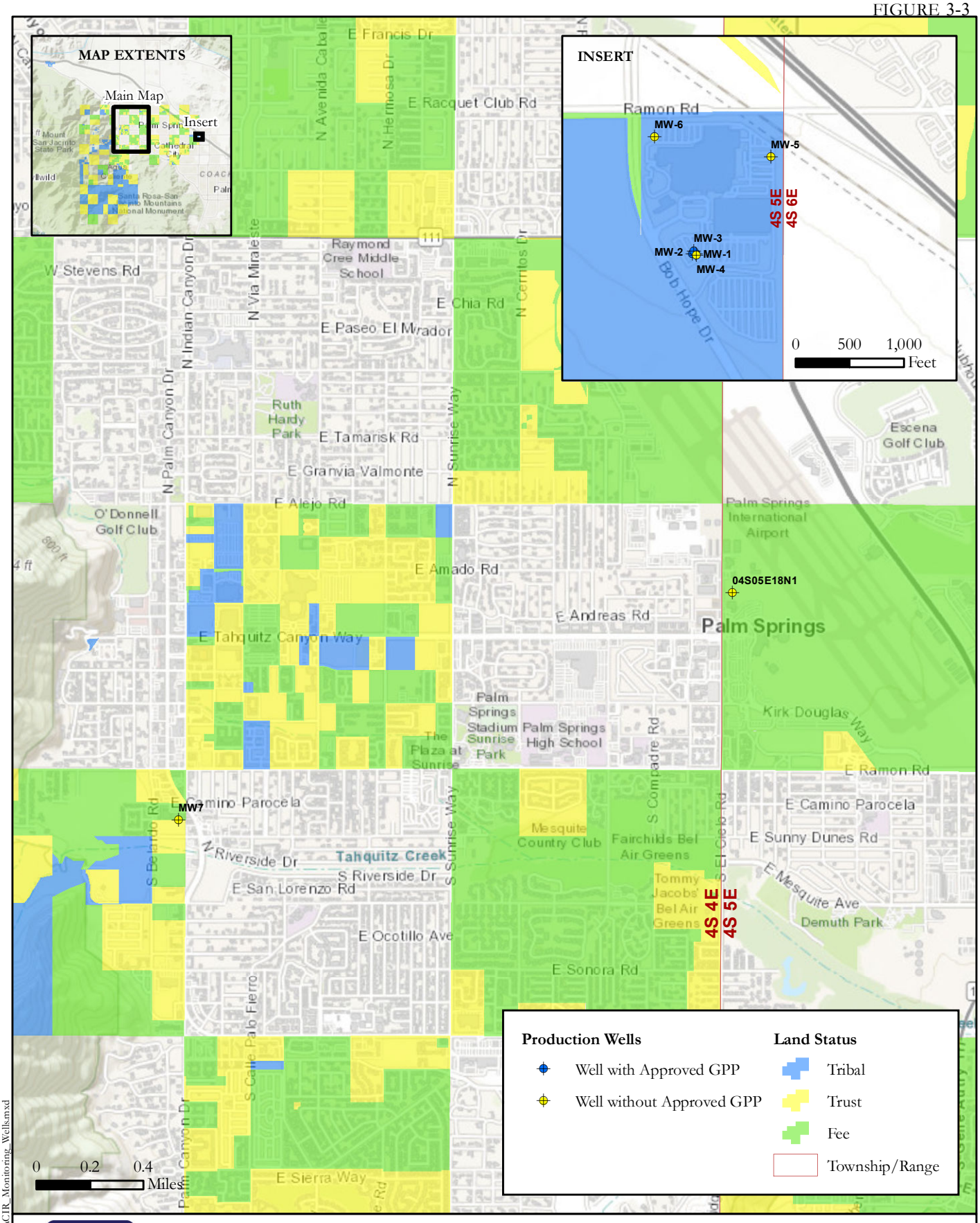
Owner	GPP Number	Well	GPP Status	Permit Face Value (AF)
ACBCI	20-01	MW-1		<1
	20-02	MW-2	Approved	<1
	20-03	MW-3		<1
		Total Permitted Amount		**3**

3.3 Groundwater Levels

ACWA currently monitors depth to water (DTW) at 18 wells on the Reservation. Of these 18 wells, eight are not accessible or have sensors which are stuck in the well, and do not have current water levels. The monthly DTW reading at each of the ten wells is shown in Figure 3-4.[8] Other wells on and near the Reservation are not monitored by ACWA, but have longer periods of record which reveal long-term trends in the water surface elevation (WSE) of groundwater below ACIR (Figure 3-5). Overall, the water level has declined by as much as 100 ft since the 1950s (Well 04S05E27E1), but has recovered in recent years by roughly 25 to 50 ft, largely due to artificial recharge of CRA water.

[8] Figures showing DTW data for ACWA-monitored wells are included in Appendix C.

FIGURE 3-3



Document Path: J:\jn2769\ACIR_Monitoring_Wells.mxd

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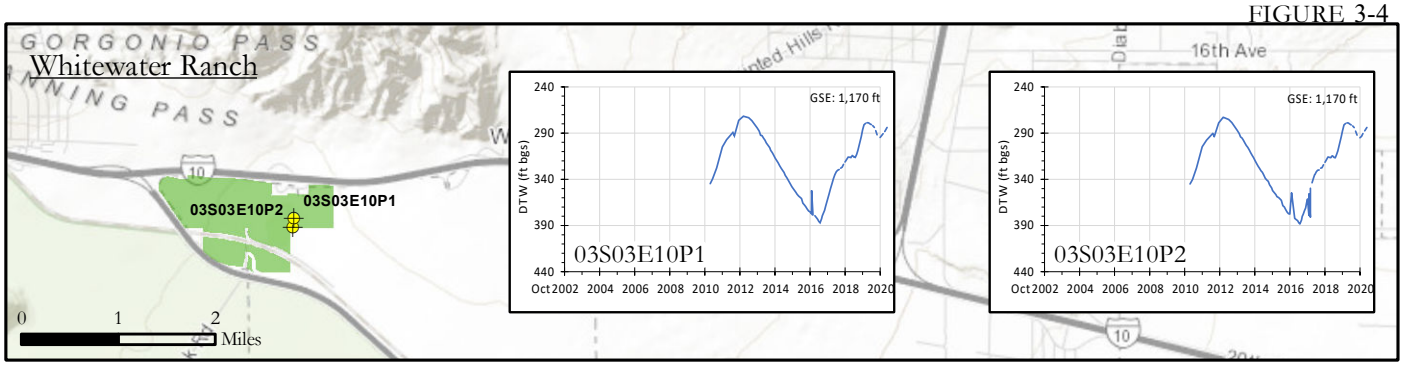
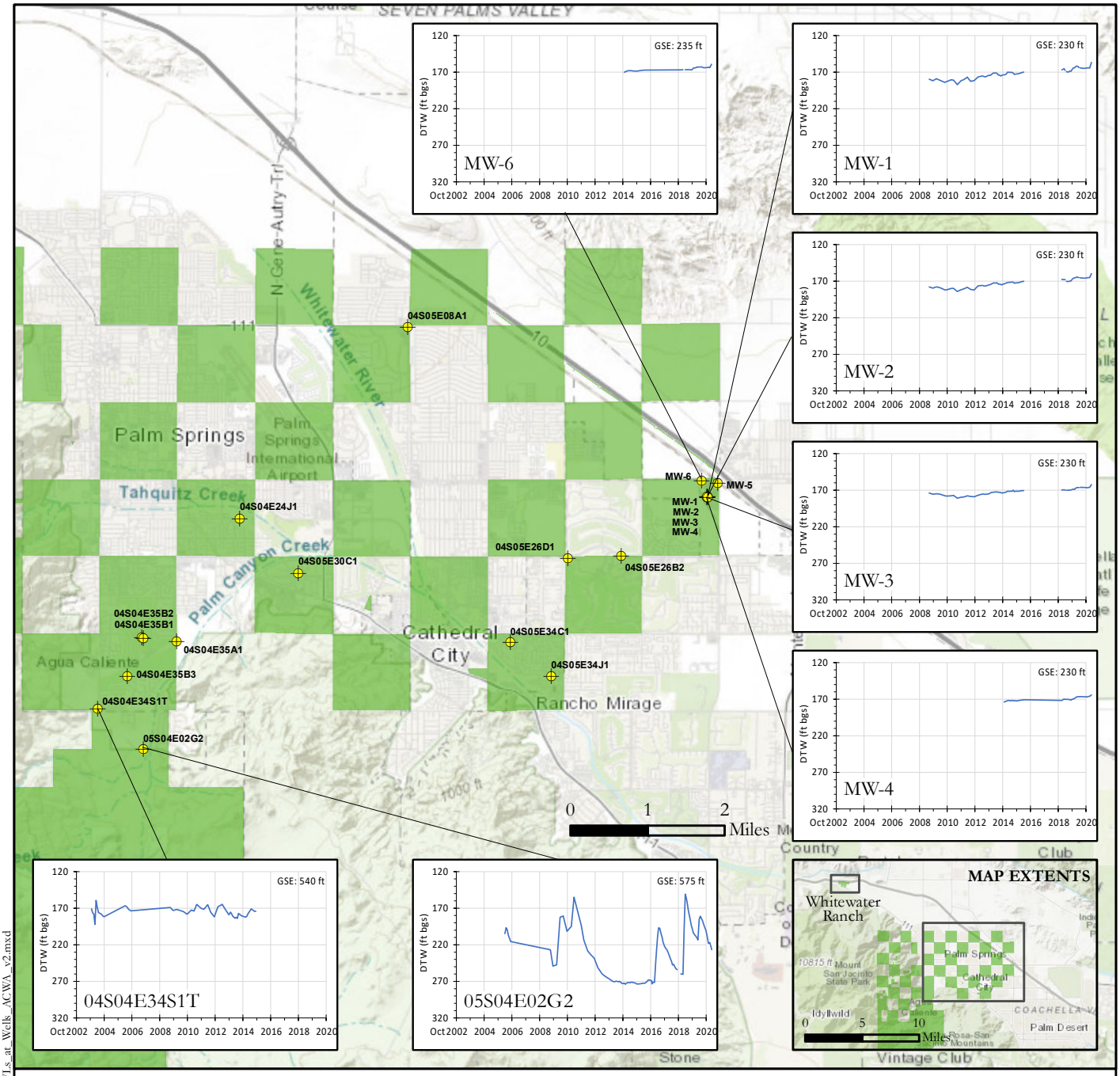
MONITORING WELLS ON AGUA CALIENTE INDIAN RESERVATION





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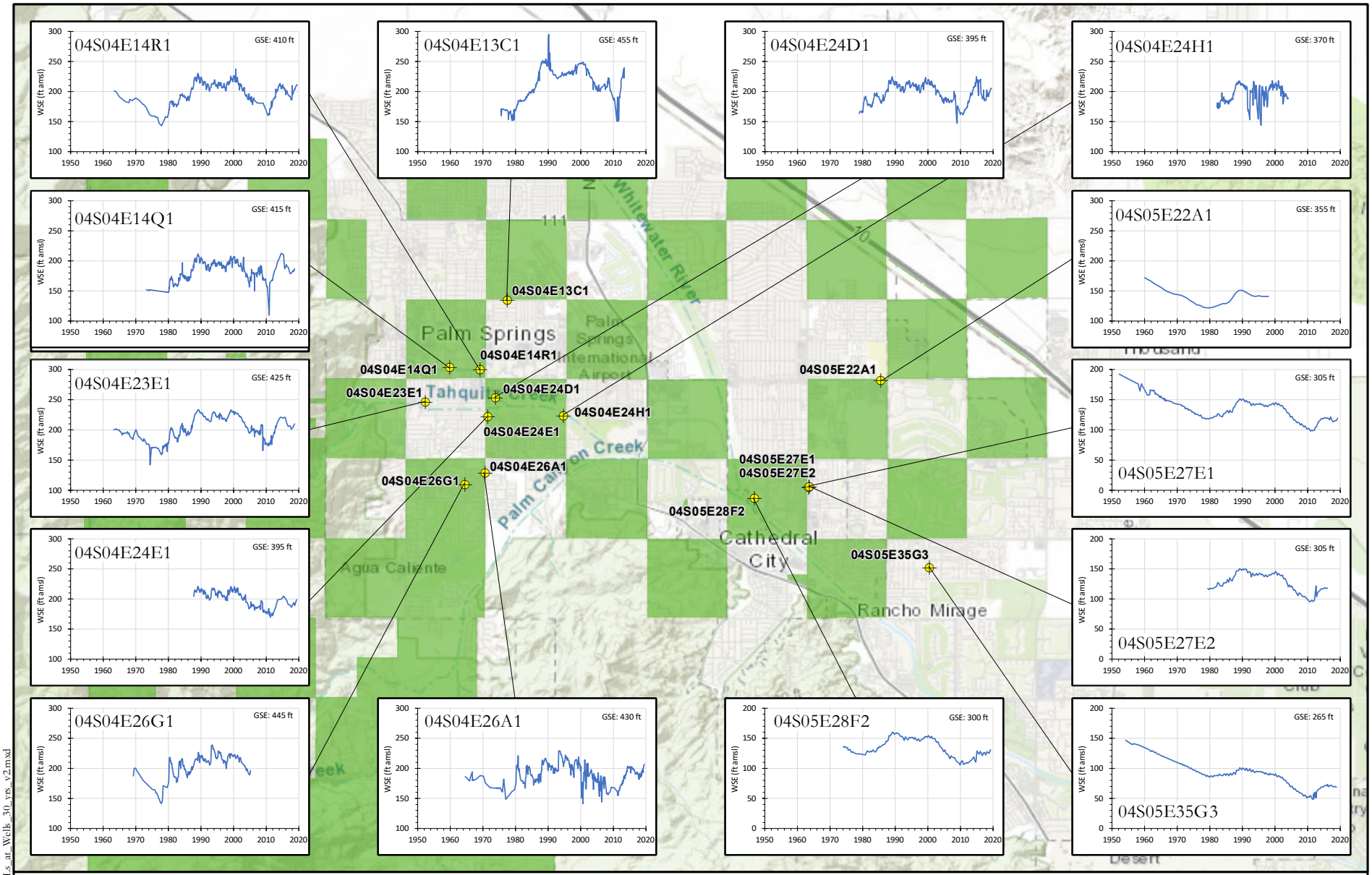
STETSON ENGINEERS INC.

Well

Agua Caliente Indian Reservation

WATER LEVELS AT WELLS MONITORED BY ACWA AGUA CALIENTE INDIAN RESERVATION

N



STETSON ENGINEERS INC.

Well

Agua Caliente Indian Reservation

WATER LEVELS AT WELLS WITH OVER 30 YEARS OF DATA AGUA CALIENTE INDIAN RESERVATION

N

0 1 2 Miles

FIGURE 3-5

Document Path: F:\jn2769\WLs_at_Wells_30_yrs_v2.mxd

Section 4: Hydrogeology

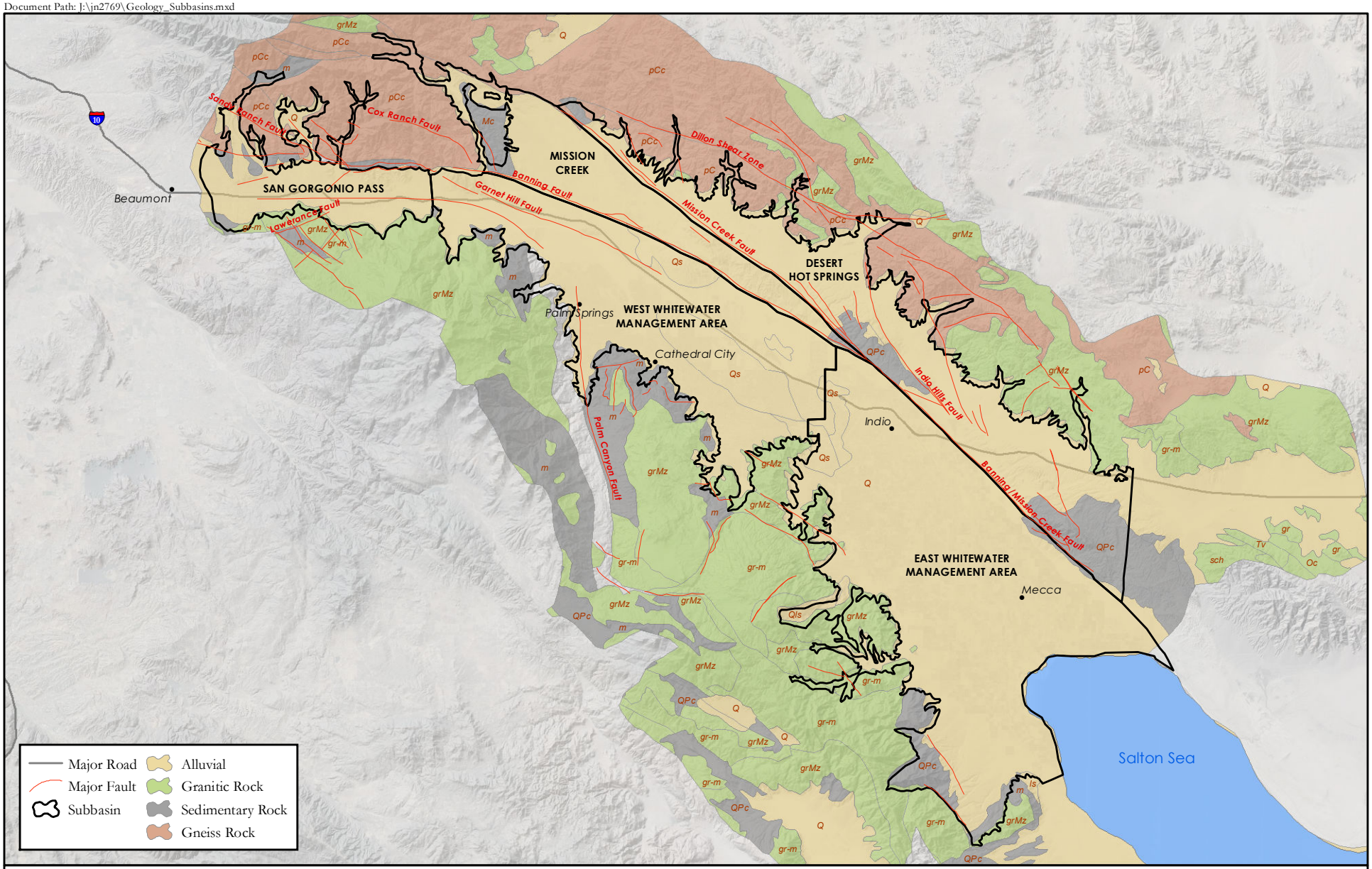
4.1 Geologic Setting

ACIR lies within the Coachella Valley Basin, a 65-mile-long northwest-southeast trending valley that starts at the San Gorgonio Pass near the town of Beaumont and extends to the southeast, terminating at the Salton Sea and encompassing an area of 440 square miles. Coachella Valley is bounded by pre-tertiary igneous and metamorphic rocks on all sides except for the southeastern end, which is bounded by the Salton Sea. To the north and east, the basin is defined by the San Bernardino and Little San Bernardino Mountains, and to the south and west by the San Jacinto Mountains, Santa Rosa Mountains, and San Gorgonio Pass. Coachella Valley lies within the Whitewater River watershed, which drains an area of approximately 1,500 square miles. The Whitewater River begins in the high-altitude mountains of San Gorgonio and San Bernardino and flows southeast to the Salton Sea. The watershed ranges in elevation from more than 10,800 ft above mean sea level at San Jacinto Mountain to -200 ft at the Salton Sea (DWR, 1964).

Coachella Valley is a part of the Salton Trough, which is a graben or rift valley that extends from Beaumont to the Gulf of Mexico. The Salton Trough was created by the interaction between the San Andreas Fault system and the Gulf of California segment of the East Pacific Rise. The trough has been filled in with thick alluvial and lacustrine sediments that reach a maximum thickness of 12,000 ft (DWR, 1964; Reichard, 1992).

There are several large sub-parallel faults present in Coachella Valley which are a part of the San Andreas Fault zone, including the Banning Fault, the Garnet Hill, the Mission Creek Fault, the Indio Fault, and the San Andreas Fault itself (Figure 4-1). These faults act as partial barriers to groundwater flow and divide the Coachella Valley into five distinct subbasins as defined in DWR Bulletin 118: the San Gorgonio Pass, Indio, Garnet Hill, Mission Creek, and Desert Hot Springs Subbasins (DWR, 1964; Reichard, 1992).

Document Path: J:\jn2769\Geology_Subbasins.mxd



STETSON ENGINEERS INC.

GEOLOGY AND SUBBASINS

0 5 10 Miles

N

FIGURE 4-1

4.2 Geology and Hydrogeology of the West Whitewater MA

Bedrock in the West Whitewater MA drops steeply from the mountainous areas in the south to an unknown depth in the center of the basin. The thick alluvial deposits consist primarily of coarse-grained heterogeneous alluvial fan deposits. Recent and Pleistocene-aged fanglomerate deposits make up the upper 300 to 400 feet of alluvium and overlay the Ocotillo Conglomerate, however there is little distinction between the two layers in drillers logs (CVWD, 2011). The Ocotillo Conglomerate consists of poorly consolidated sandstones and conglomerates with interbedded silt and clay, it is at least 2,400 ft thick and is the primary water bearing unit of the Whitewater Subbasin. The Ocotillo Conglomerate overlays the Palm Springs Formation, which is a deeper semi-water bearing unit composed of interbedded sandstone, siltstone, and claystone of continental origin (DWR, 1964).

Groundwater in the West Whitewater MA is typically found between 150 and 300 ft below ground surface (bgs), and ranges in altitude from 1,150 ft above mean sea level (amsl) in the upper reaches of the basin to -50 ft amsl in the southeastern end of the basin. Groundwater generally moves from the mountain-front areas towards the center of the basin; and in the center of the basin, groundwater moves from the northwest to the southeast (DWR, 1964).

Groundwater levels in the West Whitewater MA for October of 2019 and 2020 are shown in Figure 4-2 and Figure 4-3, respectively. On average, water levels increased by 4 ft during WY 2020; the largest changes were seen in the southern end of Palm Springs and near Indian Wells in wells 04S05E09B1, and 05S06E29C1, which saw increases of 10.2 and 12.9 ft respectively. Water levels at individual wells on the Reservation are discussed further in Section 4 of this report.

4.2.1 Sources of Recharge

The majority of natural groundwater recharge to the Whitewater Subbasin occurs in the West Whitewater MA. Natural groundwater recharge occurs through infiltration from the Whitewater River and from mountain-front recharge from the San Jacinto mountains. Precipitation that falls directly on the valley floor is assumed to be consumed by evaporation and does not contribute to groundwater recharge. Natural groundwater recharge in the West Whitewater MA is estimated to be approximately 36,000 acre-feet per year (AFY) based on average long-term hydrology, of which an estimated 7,000 AFY of groundwater underflow exits the basin to the East Whitewater MA. Natural recoverable water in the West Whitewater Subbasin is estimated to be 29,000 AFY (Tyley 1974; DWI, 2014).

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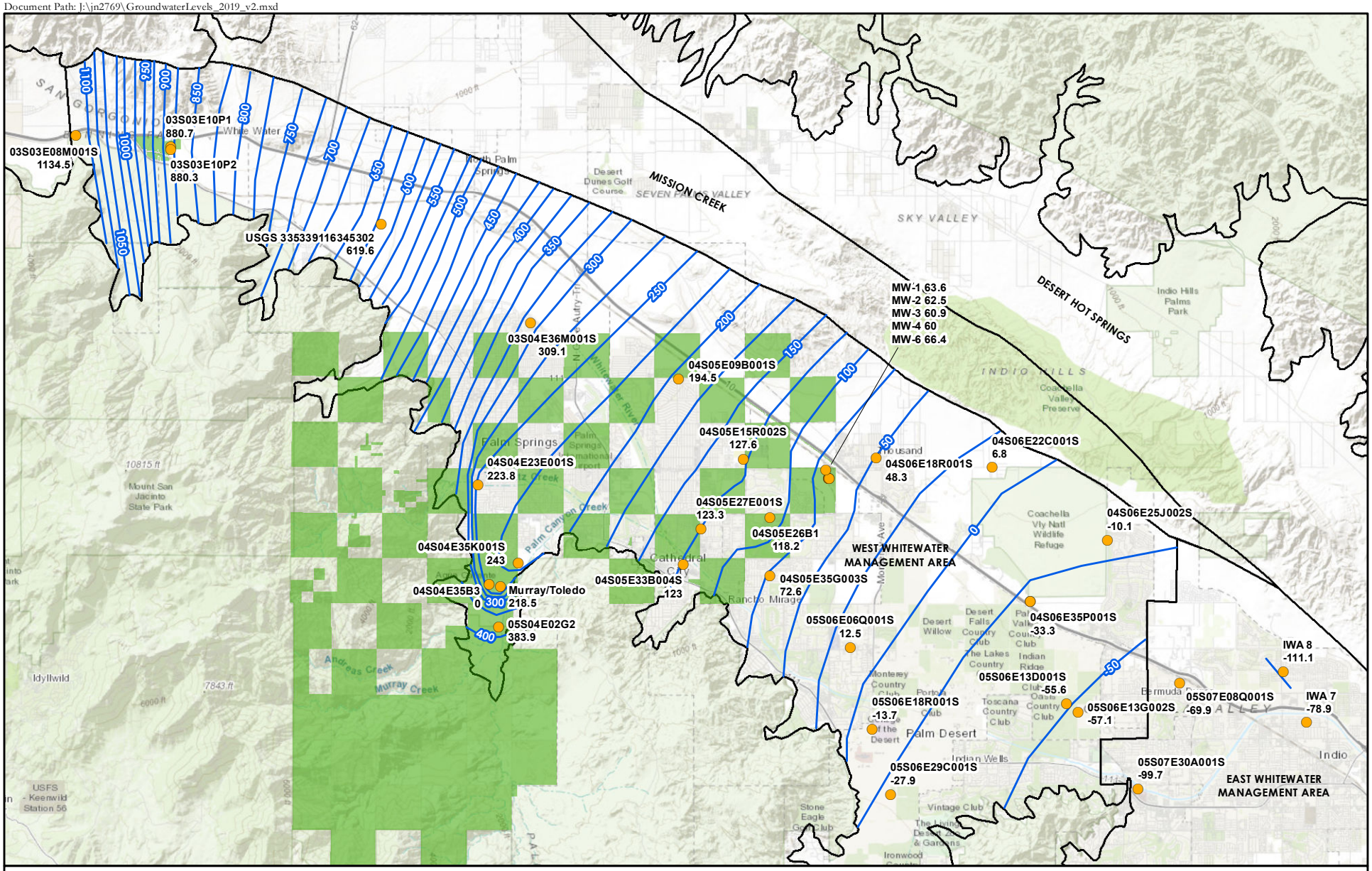

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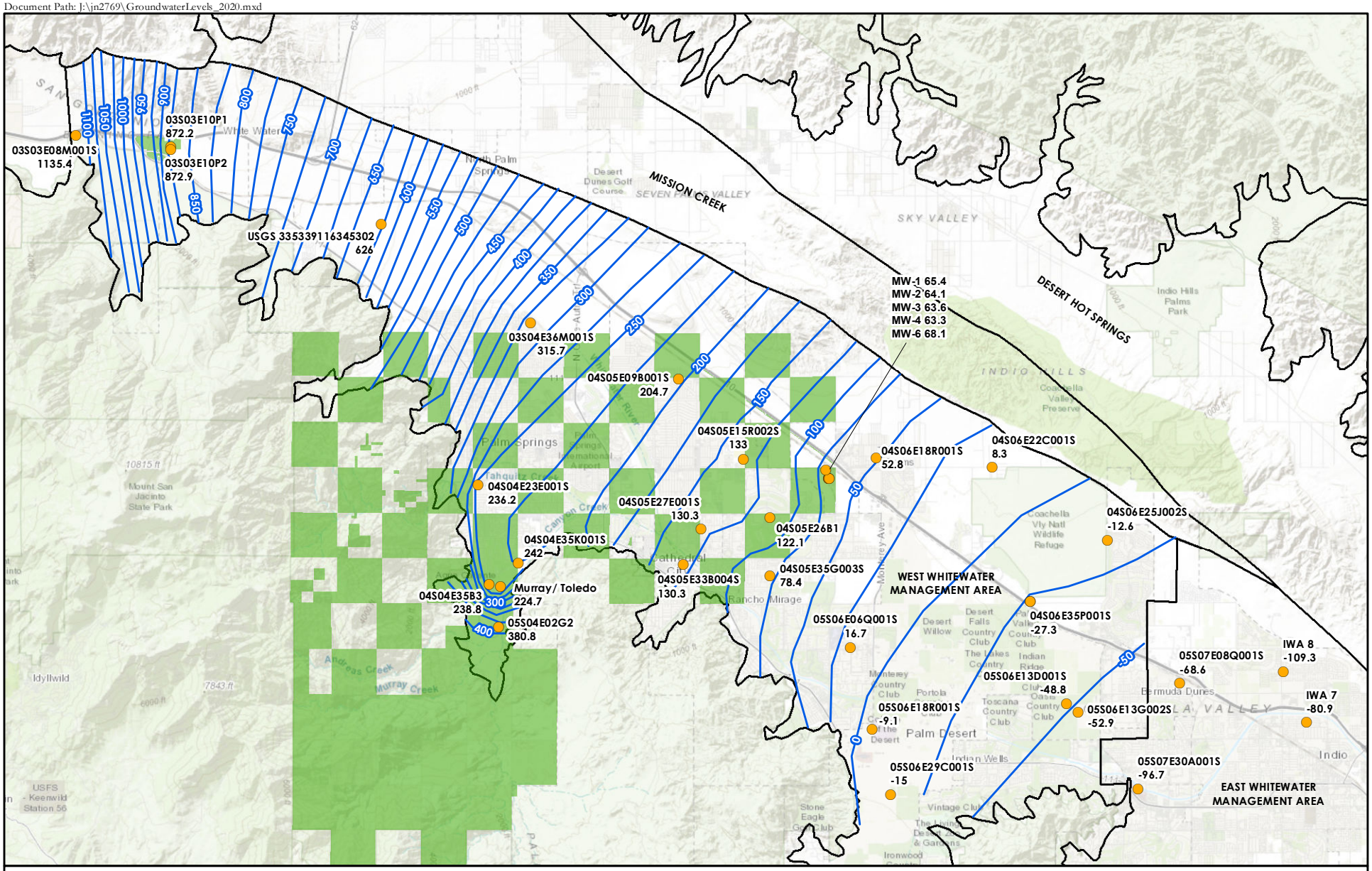
GROUNDWATER ELEVATIONS IN THE WEST WHITEWATER MANAGEMENT AREA OCTOBER 2019

FIGURE 4-2

Document Path: J:\jn2769\GroundwaterLevels_2020.mxd



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GROUNDWATER ELEVATIONS IN THE WEST WHITEWATER MANAGEMENT AREA OCTOBER 2020

FIGURE 4-3

In addition to natural recharge, artificial recharge is introduced to the Indio subbasin from the CRA at the Whitewater River Replenishment Facility (WRRF), located just northwest of the Reservation. In WY 2020, 47,540 AF were replenished at the WRRF.[9] Historical recharge at the WRRF, based on available data from the Indio Subbasin Annual Reports, is shown in Table 4-1. The total volume recharged since replenishment began in 1973 is approximately 3.7 million AF.

TABLE 4-1. ANNUAL ARTIFICIAL RECHARGE AT WRRF

Water Year	Total Volume Recharged (AF)
2017	267,793
2018	247,812
2019	213,380
2020	47,540

Source: Indio Subbasin GSA, Indio Subbasin Annual Report.

4.3 Change of Groundwater in Storage

The amount of usable groundwater storage in the West Whitewater MA and on the ACIR was estimated for WY 2019 and WY 2020 based on October water levels using the Thiessen Polygon Method (source). The West Whitewater MA was divided into 25 polygons based on the distribution of monitoring wells with groundwater level data for both 2019 and 2020 (Figure 4-4). The volume of groundwater in storage is then calculated for each polygon using the following equation:

$$S = A * b * S_y$$

S = Storage (AF); A = area (acres), b = saturated thickness (ft); S_y=specific yield (dimensionless)

Geographic Information Systems (GIS) data were used to calculate the area of each polygon and the area of ACIR land within each polygon. Areas for each polygon are presented in Appendix B.

The saturated thickness of the alluvial aquifer is not well defined, but it is deeper than any production wells on the Reservation. Therefore, the amount of usable groundwater in storage was calculated using groundwater within 1,000 ft of the surface for everywhere except Palm Canyon, where the bedrock is shallower than 1,000 ft. The depth to bedrock in the Palm Canyon area (polygons 6, 7, and 8) is assumed be approximately 630 ft based on interpolated data from drillers logs. Bedrock was encountered at a depth of 735 ft in Well 04S04E35B2 on the Indian

[9] Total deliveries to CVWD and DWA for WY 2020 were 196,803 AF, of which 47,540 AF were delivered to the Whitewater River Replenishment Facility, 1,341 AF to the Mission Creek Groundwater Recharge Facility, and 147,922 AF were credits from the Advanced Delivery Account. See Annual Indio Subbasin Alternative GSP Reports for other years.

Canyons Golf Resort near the mouth of Palm Canyon, and bedrock was not found in well 05S04E02G2, which was drilled to a depth of 528 ft and is further up the canyon. Bedrock is assumed to be closer to the surface near the edges of the alluvial aquifer in the canyon and it is assumed that the bedrock slopes at the same angle as the hills surrounding the canyon. This is an estimate and should be refined if and when new data becomes available.

The specific yield describes the drainable volume of water in the soil and is a function of the porosity and grain size of the sediment in the aquifer. The specific yield is assumed to be 0.15 for the majority of the West Whitewater MA, and 0.13 for the polygons in Palm Canyon (Reichard, 1992).

The volume of usable groundwater in storage in the West Whitewater MA for WY 2019 and WY 2020 is summarized in Table 4-2. Results for each polygon are presented in Appendix B. Storage on the Reservation increased in the central part of the basin, with the largest increase occurring east of the Palm Springs International Airport. Storage decreased slightly in Palm Canyon.

TABLE 4-2. USABLE GROUNDWATER IN STORAGE (AF)

	Oct-2019	Oct-2020	Change
West Whitewater MA	15,770,200	15,871,600	101,400
ACIR	2,199,600	2,218,400	18,800

The main advantage of using the Thiessen Polygon method for calculating groundwater storage is that once the groundwater measurement points are established it is easy to calculate changes in storage from one year to the next. A disadvantage is that if the sampling points are too close to either a production well or recharge source, the results for the entire polygon can be skewed. The method can be improved by increasing the number of sampling points, thus increasing the discretization of the basin and decreasing the impact any one well has on the storage change calculation. Recommendations for improvements to be made to the storage calculation include: monitoring groundwater levels in additional wells, especially near the Palm Springs Airport; improving the estimate of the specific yield estimates; and improving the depth to bedrock estimates in Palm Canyon.

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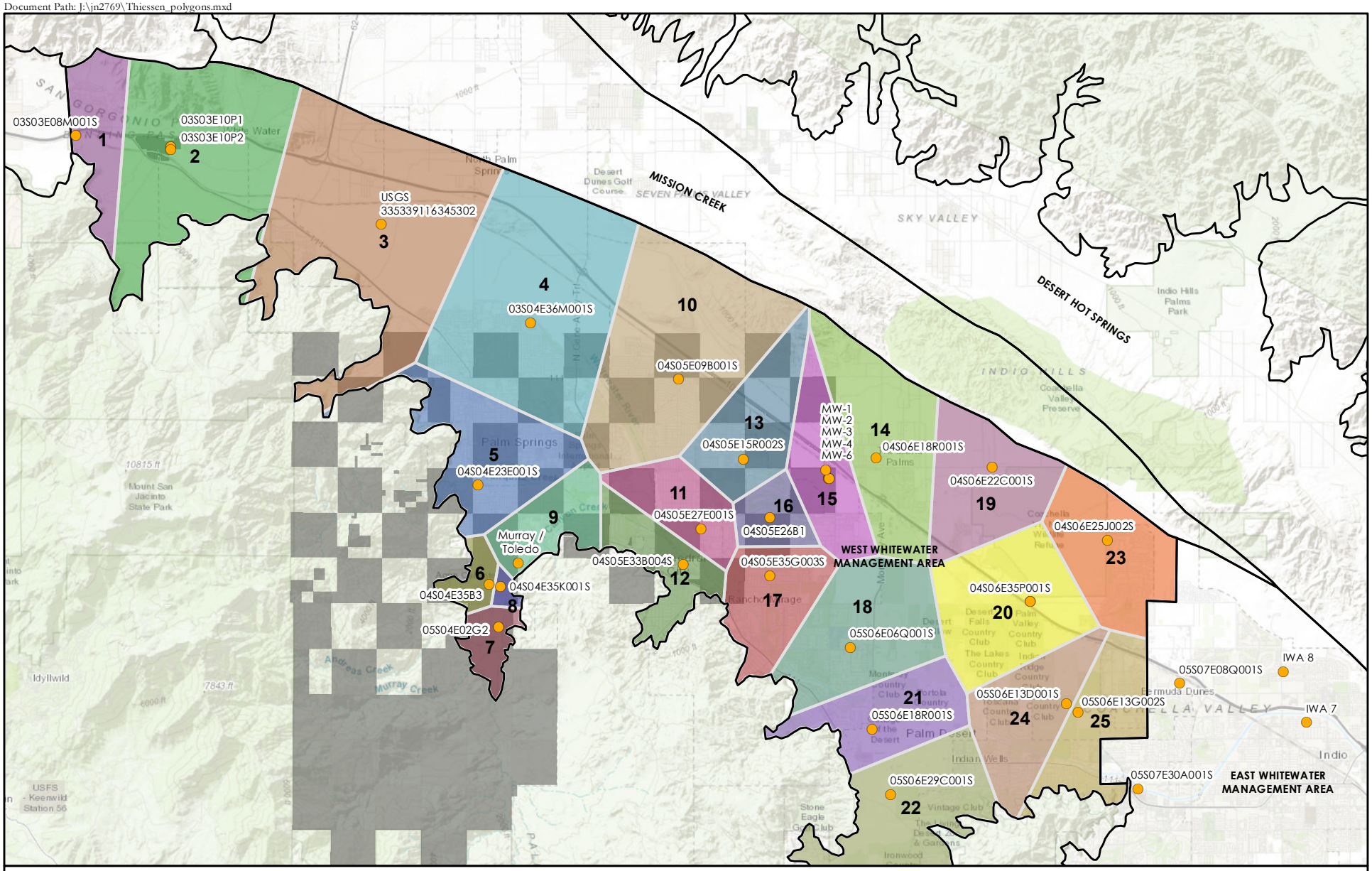


STETSON ENGINEERS INC.

- Water Level Points
- Agua Caliente Indian Reservation
- Subbasin

THIESSEN POLYGONS
USED FOR
WEST WHITEWATER MANAGEMENT AREA
STORAGE CALCULATION

0 1.5 3 Miles

N

FIGURE 4-4

Section 5: Groundwater Quality

5.1 General Water Quality

Groundwater quality is an important factor in maintaining a secure and sustainable groundwater resource on the Reservation. The purpose of monitoring groundwater quality is two-fold: 1) to assure groundwater is meeting applicable standards for its intended use; and, 2) to track changes over time to assess potential impacts to the Tribe's resource before they occur. Typically, numeric groundwater quality objectives (WQOs) are established by the RWQCB Basin Plan. Presently, numeric WQOs do not exist for total dissolved solids (TDS) or other constituents of concern (COC) such as nitrate, boron, arsenic, or total chromium. Instead, the RWQCB has established a qualitative standard that states: "the objective will be to maintain the existing water quality where feasible."

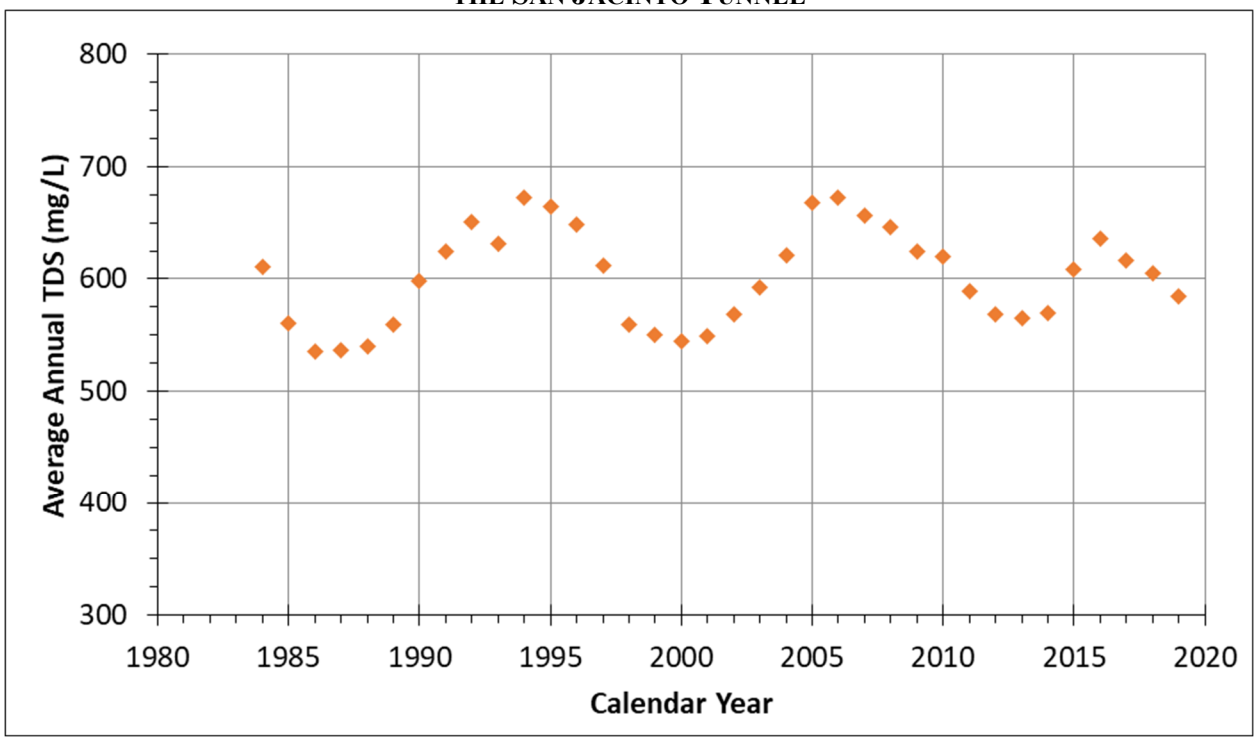
Management planning is currently under way by CVWD, DWA, and other stakeholders, including the Tribe, to develop an SNMP. The process includes developing numeric standards for salts and nutrients through analysis of assimilative capacity based on existing and expected future water quality. Until these numeric limits are established and adopted by the RWQCB, this groundwater management plan will compare annual water quality results to historic water quality, when available.

ACWA conducts annual sampling and analysis for COCs that can be used to characterize the groundwater quality.

5.1.1 Quality of Imported Water

The amount of Table A water delivered to the WRRF through the MWD Exchange program in WY 2020 was 47,540 AF. Average TDS of the water released from the Colorado River Aqueduct in 2019 was 585 mg/L. The water quality averaged approximately 602 mg/L from 1984 to 2019, as shown in Figure 5-1.

FIGURE 5-1. HISTORICAL WATER QUALITY OF COLORADO RIVER WATER MEASURED AT THE SAN JACINTO TUNNEL



5.2 Groundwater Quality

As in the case of general minerals, ACWA will need further time and data to develop a comprehensive understanding of nitrate concentrations and any changes therein in the groundwater underlying the Reservation. Standards that can be used for assessing groundwater used for drinking water are EPA drinking primary and secondary drinking water standards. Examples of those standards include: TDS of 500 mg/L; Nitrate (as N) of 10 mg/L; Boron f 1.0 mg/L (an agricultural supply target); and Total Chromium: 0.05 mg/L (50 µg/L) (the primary MCL).

Constituents of concern in the Coachella Valley that were identified in the Coachella Valley Water Management Plan Update (CVWD, 2012) include: Arsenic, Perchlorate, Chromium 6, Uranium, Carcinogens, and Endocrine Disrupting Compounds. Although arsenic and uranium exceeding the U.S. EPA MCL levels were found in the East Valley and Mission Creek areas, CVWD and DWA perform ongoing monitoring of all public supply wells for these constituents. Chromium 6 is more widespread throughout the Coachella Valley, occurring in more than 100 wells in the early 2000s. As recommended in the 2012 Management Plan Update, these constituents should continue to be monitored.

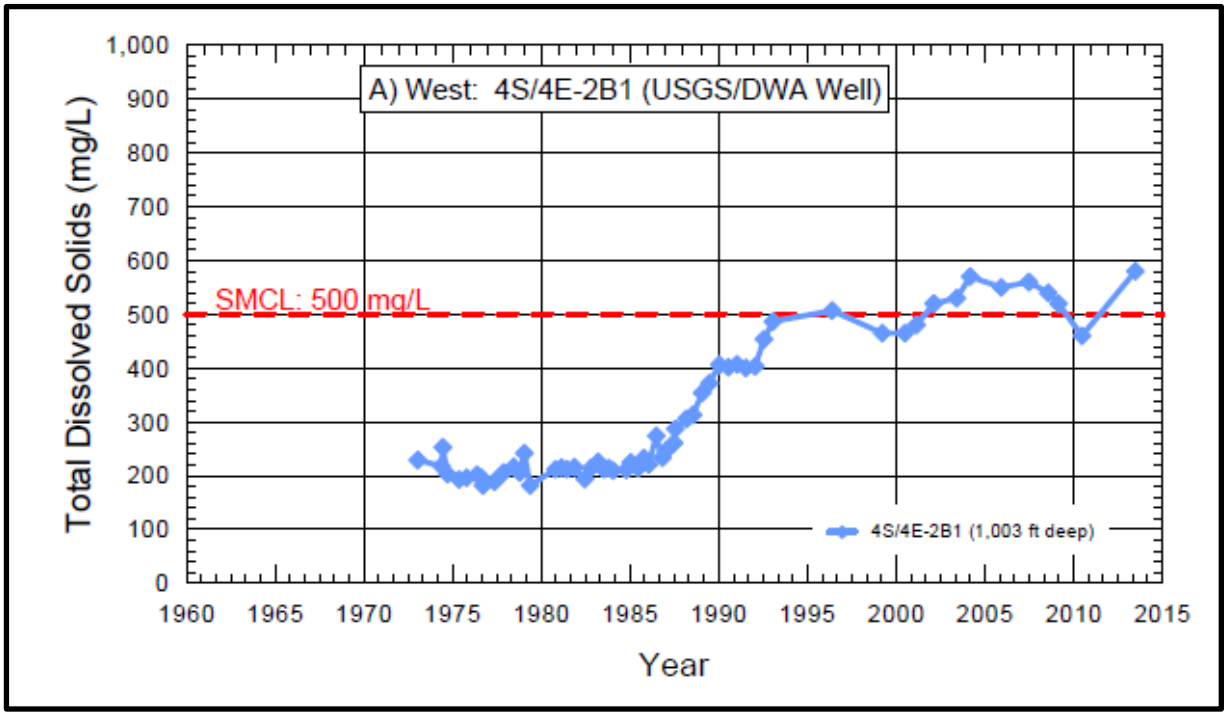
Elevated perchlorate and TDS concentrations have been linked to Colorado River water discharged in the Indio Subbasin by CVWD and DWA. Perchlorate concentrations that were

originally above the U.S. EPA MCL of 6 µg/L were measured at Lake Havasu in the early 2000s. Since that time, mitigation measures along the Colorado River reduced the concentration to between 1 and 2 µg/L by 2012. Similarly, elevated TDS concentrations in the groundwater supply have also been linked to Colorado River discharge as discussed in Section 5.1.1. As both perchlorate and TDS migrate downgradient in the groundwater aquifer from the WRRF toward the Reservation, monitoring for these constituents should occur.

5.3 TDS Quality on Reservation Lands

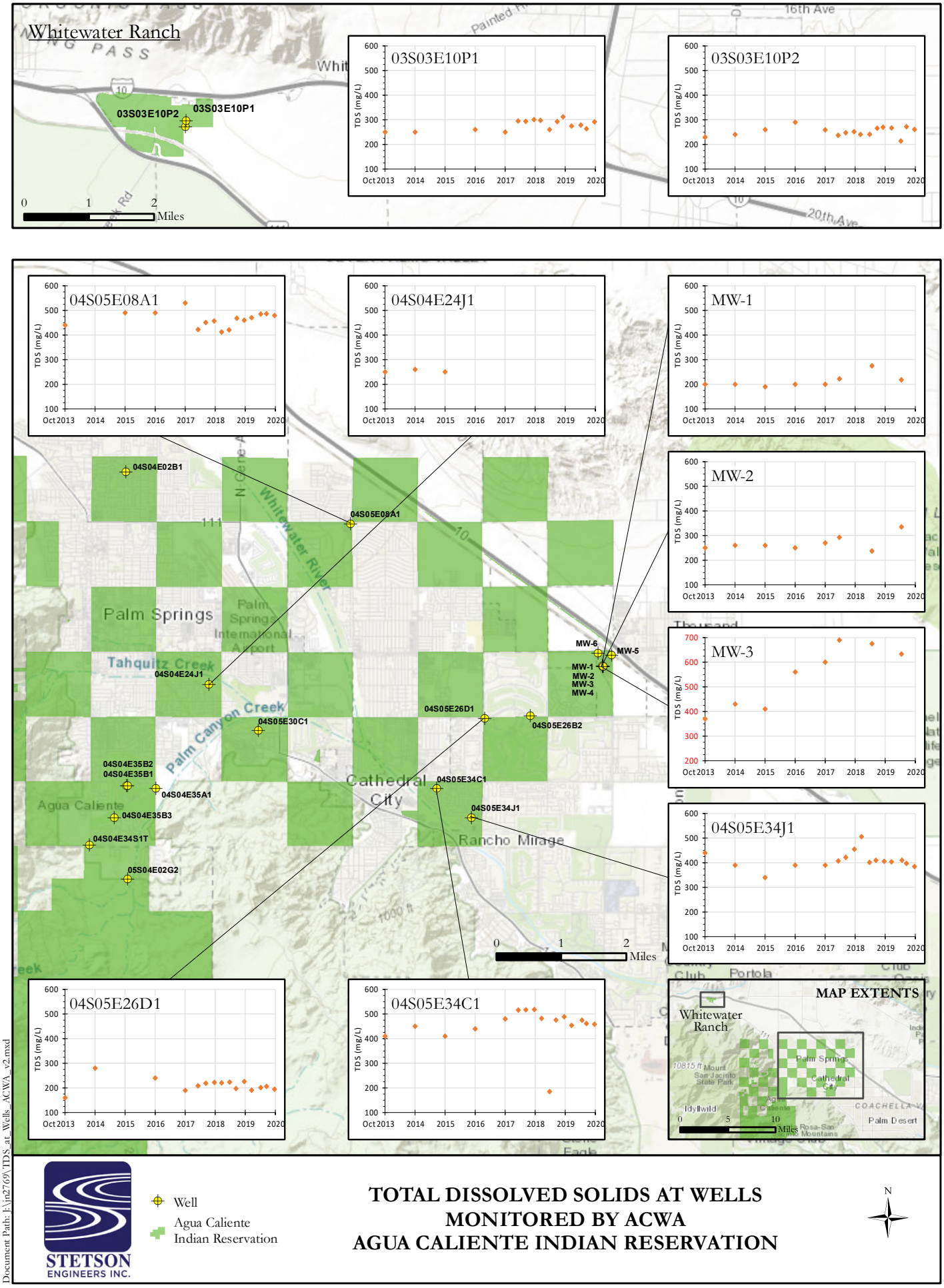
TDS has been measured at the northern portion of the reservation near East Francis Drive and North Sunrise Way since 1972 at monitoring well 04S04E02B1 (Figure 5-2). The well is located downgradient from the WRRF and is the northernmost well on the Reservation that is available to monitor the impact of Colorado River releases by CVWD and DWA. While Colorado River water has been recharged in the Coachella Basin since the middle of the 1900s, significant quantities of imported water began in the 1970s. A response to elevated TDS concentrations were first observed in the late 1980s when the values began to rise above the background level of 200 mg/L. Based on data collected in 2014, the TDS concentration had risen 400 mg/L from 200 mg/L to almost 600 mg/L.

FIGURE 5-2. TDS CONCENTRATION AT NORTHWEST SIDE OF RESERVATION



Monitoring well 04S04E02B1is screened from 570 to 1,003 ft bgs, indicating a change in water quality has occurred in deeper portion of the aquifer. Further down valley in the Cathedral City area, monitoring well 04S05E34C1 shows an elevated TDS of 500 mg/L from shallower water samples collected from between 240 and 500 feet bgs (Figure 5-3). Other monitoring wells monitored by ACWA, which have continuous TDS records between 2013 and the present, are also shown on Figure 5-3. Review of these data show a wide variation in TDS concentrations due to their sample depth and location.

Because factors such as return flow from applied domestic and recycled water, urbanization, and proximity to recharge sources contribute to a well's observed TDS concentration, a comprehensive investigation is required to assess the cause of the observed impact. At this time, water quality analyses at each of these monitoring wells should continue to occur so changes or trends can be observed.


Whitewater Ranch
03S03E10P2
03S03E10P1
03S03E10P1
03S03E10P2
04S05E08A1
04S04E24J1
MW-1
MW-2
MW-3
04S05E34J1
04S05E26D1
04S05E34C1
04S04E02B1
04S05E08A1
04S04E24J1
04S05E30C1
04S05E26D1
04S05E26B2
04S04E35B2
04S04E35B1
04S04E35A1
04S04E35B3
04S04E34S1T
05S04E02G2
04S05E34C1
04S05E34J1
MW-6
MW-5
MW-1
MW-2
MW-3
MW-4
Palm Springs
Palm Springs International Airport
Tahquitz Creek
Palm Canyon Creek
Whitewater River
Cathedral City
Agua Caliente
Rancho Mirage
Portola
TDS (mg/L)
Oct 2013
2014
2015
2016
2017
2018
2019
2020
0 1 2 Miles
MAP EXTENTS
Whitewater Ranch
Palm Springs
Cathedral City
Idyllwild
Palm Desert
0 5 10 Miles
Well
Agua Caliente Indian Reservation
STETSON ENGINEERS INC.
TOTAL DISSOLVED SOLIDS AT WELLS MONITORED BY ACWA
AGUA CALIENTE INDIAN RESERVATION
N
Document Path: J:\jn2769\TDS_at_Wells_ACWA_v2.mxd

Section 6: Groundwater Management

6.1 Protection of Water Resources

The long-term decline in groundwater levels is a well-known condition affecting the Coachella Valley. The Reservation has experienced a lowering of groundwater levels as a result of the overdraft of the West Whitewater MA. Current groundwater levels under the Reservation are lower than they were at the Reservation's establishment due to overdraft of the West Whitewater MA. In addition to the loss of the water as a resource, lower groundwater elevations lead to higher costs to pump water from wells and can cause decreased water quality and increased costs to re-drill wells to reach deeper into the aquifer. While water is a naturally renewable resource, the rate of withdrawal has to balance the rate of recharge to avoid adverse impacts. In some areas, declines in groundwater can also result in subsidence, where the elevation of the ground declines in response to the lower hydrostatic pressure on fine-grained soils within the aquifer. While artificial recharge activities in the Coachella Valley have the potential to prevent further decline in water levels, they pose a risk to water quality because the imported water is of poorer quality than the existing or naturally occurring water quality. Moreover, local non-Tribal agencies that engage in artificial recharge activities have indicated that they will not restore groundwater levels under the Reservation to their pre-overdraft levels.

6.2 Groundwater Production Fee Assessment

ACWA has calculated a groundwater production fee assessment consistent with Tribal Ordinance 55. The proposed production fee is currently under consideration by the ACWA Board and, if adopted, could be imposed on permitted pumpers for WY 2022. Once adopted, this section of the report will address expenses and revenues consistent with maintaining the fee in future editions.

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Appendix A

AVAILABLE PRODUCTION DATA FOR WELLS WITH GPPS

A1. Whitewater Ranch

2 Wells - 03S03E10P1, 03S03E10P2

Well number:	03S03E10P1
Date drilled:	6/7/1970
Total depth:	776 ft
Flowrate:	2,000 gpm
Permit face value:	5.00 AFY
Period of record:	--
Average production:	-- AFY

Available Production Data

Year	Volume (AF)	Data Source
No available production data		

Well number:	03S03E10P2
Date drilled:	1978
Total depth:	906 ft
Flowrate:	Unknown
Permit face value:	5.00 AFY
Period of record:	--
Average production:	-- AFY

Available Production Data

Year	Volume (AF)	Data Source
No available production data		

A2. Indian Canyon Golf Resort

4 Wells - 04S04E35A1, 04S04E35B1, 04S04E35B2, 04S04E35B3

Well number:	04S04E35A1
Date drilled:	1960
Total depth:	700 ft
Flowrate:	300 gpm
Permit face value:	200 AFY
Period of record:	1961 - 2019
Average production:	449 AFY

*Currently used as backup well for 04S04E35B2

Available Production Data

Year	Volume (AF)	Data Source
1961	13	K&S 2014
1962	398	K&S 2014
1963	232	K&S 2014
1964	508	K&S 2014
1965	598	K&S 2014
1966	645	K&S 2014
1967	535	K&S 2014
1968	575	K&S 2014
1969	506	K&S 2014
1970	644	K&S 2014
1971	682	K&S 2014
1972	756	K&S 2014
1973	618	K&S 2014
1974	629	K&S 2014
1975	525	K&S 2014
1976	505	K&S 2014
1977	664	K&S 2014
1978	587	K&S 2014
1979	273	K&S 2014
1980	343	K&S 2014
1981	377	K&S 2014
1982	384	K&S 2014
1983	877	K&S 2014
1984	959	K&S 2014
1985	564	WY 1985-15
1986	587	WY 1985-15
1987	0	WY 1985-15
1988	6	WY 1985-15
1989	93	WY 1985-15
1990	228	DWA
1991	25	DWA
1992	28	DWA
1993	21	DWA
1994	152	DWA
1995	212	DWA
1996	369	DWA
1997	283	DWA
1998	258	DWA
1999	526	DWA
2000	553	DWA
2001	536	DWA
2002	244	DWA
2003	28	DWA
2004	0	DWA
2005	0	DWA
2006	0	DWA
2007	0	DWA
2008	0	DWA
2009	0	DWA
2010	0	DWA
2011	0	DWA
2012	0	DWA
2013	0	DWA
2014	0	DWA
2015	0	DWA
2016	0	DWA
2017	0	DWA
2018	0	DWA
2019	0	DWA

Well number:	04S04E35B1
Date drilled:	1961
Total depth:	680 ft
Flowrate:	500 gpm
Permit face value:	600 AFY
Period of record:	1961 - 2019
Average production:	303 AFY

*Currently used as backup well for 04S04E35B2

Available Production Data

Year	Volume (AF)	Data Source
1961	324	K&S 2014
1962	835	K&S 2014
1963	905	K&S 2014
1964	585	K&S 2014
1965	434	K&S 2014
1966	498	K&S 2014
1967	690	K&S 2014
1968	698	K&S 2014
1969	541	K&S 2014
1970	721	K&S 2014
1971	604	K&S 2014
1972	527	K&S 2014
1973	514	K&S 2014
1974	480	K&S 2014
1975	588	K&S 2014
1976	832	K&S 2014
1977	703	K&S 2014
1978	717	K&S 2014
1979	993	K&S 2014
1980	1,115	K&S 2014
1981	878	K&S 2014
1982	774	K&S 2014
1983	347	K&S 2014
1984	366	K&S 2014
1985	873	K&S 2014
1986	611	WY 1985-15
1987	0	WY 1985-15
1988	0	WY 1985-15
1989	85	WY 1985-15
1990	52	DWA
1991	2	DWA
1992	1	DWA
1993	1	DWA
1994	1	DWA
1995	91	DWA
1996	43	DWA
1997	46	DWA
1998	58	DWA
1999	2	DWA
2000	11	DWA
2001	2	DWA
2002	3	DWA
2003	10	DWA
2004	2	DWA
2005	37	DWA
2006	5	DWA
2007	2	DWA
2008	13	DWA
2009	0	DWA
2010	13	DWA
2011	20	DWA
2012	228	DWA
2013	0	DWA
2014	0	DWA
2015	0	DWA
2016	0	DWA
2017	0	DWA
2018	0	DWA
2019	0	DWA

Well number:	04S04E35B2
Date drilled:	1986
Total depth:	730 ft
Flowrate:	1,200 gpm
Permit face value:	800 AFY
Period of record:	1986 - 2019
Average production:	752 AFY

Available Production Data

Year	Volume (AF)	Data Source
1986	243	WY 1985-15
1987	1,189	WY 1985-15
1988	1,019	WY 1985-15
1989	995	WY 1985-15
1990	860	DWA
1991	943	DWA
1992	1,027	DWA
1993	662	DWA
1994	995	DWA
1995	864	DWA
1996	996	DWA
1997	893	DWA
1998	813	DWA
1999	941	DWA
2000	674	DWA
2001	894	DWA
2002	969	DWA
2003	936	DWA
2004	1,037	DWA
2005	915	DWA
2006	1,029	DWA
2007	1,055	DWA
2008	995	DWA
2009	1,042	DWA
2010	968	DWA
2011	1,017	DWA
2012	98	DWA
2013	0	DWA
2014	0	DWA
2015	0	DWA
2016	0	DWA
2017	0	DWA
2018	0	DWA
2019	0	DWA

Well number:	04S04E35B3
Date drilled:	2020
Total depth:	640
Flowrate:	1,950
Permit face value:	800
Period of record:	--
Average production:	--

Available Production Data

Year	Volume (AF)	Data Source

New well, no available data

Note: DWA data received via file transfer August 15, 2019 after Public Records Act request filed July 15, 2019.

A3. Union Pacific Railroad

1 Well - 04S05E04F1

Well number:	04S05E04F1	
Date drilled:	1967	
Total depth:	610	ft
Flowrate:	1,400	gpm
Permit face value:	500	AFY
Period of record:	1976 - 2012	
Average production:	1,173	AFY

Available Production Data

Year	Volume (AF)	Data Source
1976	1,596	K&S 2014
1977	1,596	K&S 2014
1978	1,596	K&S 2014
1979	1,596	K&S 2014
1980	1,596	K&S 2014
1981	1,514	K&S 2014
1982	1,870	K&S 2014
1983	1,575	K&S 2014
1984	1,145	K&S 2014
1985	1,658	K&S 2014
1986	1,056	K&S 2014
1987	1,098	K&S 2014
1988	808	K&S 2014
1989	833	K&S 2014
1990	1,034	K&S 2014
1991	705	K&S 2014
1992	609	K&S 2014
1993	828	K&S 2014
1994	799	K&S 2014
1995	503	K&S 2014
1996	208	K&S 2014
1997	771	K&S 2014
1998	581	K&S 2014
1999	1,030	K&S 2014
2000	753	K&S 2014
2001	952	K&S 2014
2002	613	K&S 2014
2003	160	K&S 2014
2004	821	K&S 2014
2005	284	K&S 2014
2006	5	K&S 2014
2007	314	K&S 2014
2008	1,245	K&S 2014
2009	1,105	K&S 2014
2010	7,724	K&S 2014
2011	1,399	K&S 2014
2012	1,433	K&S 2014

A4. Date Palm Country Club

2 Wells - 04S05E34C1, 04S05E34J1

Well number:	04S05E34C1
Date drilled:	1970
Total depth:	500 ft
Flowrate:	875 gpm
Permit face value:	519 AFY
Period of record:	1976 - 2012
Average production:	246 AFY

Available Production Data

Year	Volume (AF)	Data Source	
1976	255	K&S 2014	
1977	205	K&S 2014	
1978	254	K&S 2014	
1979	214	K&S 2014	
1980	215	K&S 2014	
1981	204	K&S 2014	
1982	203	K&S 2014	
1983	232	K&S 2014	
1984	252	K&S 2014	
1985	291	K&S 2014	
1986	272	K&S 2014	
1987	253	K&S 2014	
1988	308	K&S 2014	
1989	290	K&S 2014	
1990	311	K&S 2014	
1991	252	K&S 2014	
1992	222	K&S 2014	
1993	239	K&S 2014	
1994	255	K&S 2014	
1995	272	K&S 2014	
1996	246	K&S 2014	
1997	239	K&S 2014	
1998	230	K&S 2014	
1999	245	K&S 2014	
2000	246	K&S 2014	
2001	239	K&S 2014	
2002	244	K&S 2014	
2003	187	K&S 2014	
2004	263	K&S 2014	
2005	229	K&S 2014	
2006	283	K&S 2014	
2007	223	K&S 2014	
2008	651	K&S 2014	Combined with 04S05E34J1
2009	506	K&S 2014	Combined with 04S05E34J1
2010	441	K&S 2014	Combined with 04S05E34J1
2011	571	K&S 2014	Combined with 04S05E34J1
2012	593	K&S 2014	Combined with 04S05E34J1

Well number:	04S05E34J1
Date drilled:	1970
Total depth:	500 ft
Flowrate:	625 gpm
Permit face value:	470 AFY
Period of record:	1976 - 2012
Average production:	336 AFY

Available Production Data

Year	Volume (AF)	Data Source	
1976	299	K&S 2014	
1977	240	K&S 2014	
1978	167	K&S 2014	
1979	177	K&S 2014	
1980	166	K&S 2014	
1981	193	K&S 2014	
1982	202	K&S 2014	
1983	252	K&S 2014	
1984	264	K&S 2014	
1985	248	K&S 2014	
1986	244	K&S 2014	
1987	249	K&S 2014	
1988	334	K&S 2014	
1989	345	K&S 2014	
1990	383	K&S 2014	
1991	338	K&S 2014	
1992	304	K&S 2014	
1993	316	K&S 2014	
1994	282	K&S 2014	
1995	263	K&S 2014	
1996	406	K&S 2014	
1997	438	K&S 2014	
1998	477	K&S 2014	
1999	526	K&S 2014	
2000	475	K&S 2014	
2001	523	K&S 2014	
2002	520	K&S 2014	
2003	490	K&S 2014	
2004	457	K&S 2014	
2005	324	K&S 2014	
2006	370	K&S 2014	
2007	487	K&S 2014	
2008	651	K&S 2014	Combined with 04S05E34C1
2009	506	K&S 2014	Combined with 04S05E34C1
2010	441	K&S 2014	Combined with 04S05E34C1
2011	571	K&S 2014	Combined with 04S05E34C1
2012	593	K&S 2014	Combined with 04S05E34C1

A5. Desert Princess HOA

1 Well - 04S05E08A1

Well number:	04S05E08A1		
Date drilled:	1979		
Total depth:	1,100	ft	
Flowrate:	3,075	gpm	
Permit face value:	910	AFY	
Period of record:	1979 - 2019		Production from 2013-2016 unknown.
Average production:	826	AFY	

Available Production Data

Year	Volume (AF)	Data Source
1979	0	K&S 2014
1980	141	K&S 2014
1981	78	K&S 2014
1982	75	K&S 2014
1983	89	K&S 2014
1984	1,014	K&S 2014
1985	1,159	K&S 2014
1986	1,065	K&S 2014
1987	948	K&S 2014
1988	1,024	K&S 2014
1989	1,051	K&S 2014
1990	978	K&S 2014
1991	952	K&S 2014
1992	860	K&S 2014
1993	876	K&S 2014
1994	909	K&S 2014
1995	856	K&S 2014
1996	564	K&S 2014
1997	979	K&S 2014
1998	907	K&S 2014
1999	1,083	K&S 2014
2000	1,077	K&S 2014
2001	912	K&S 2014
2002	921	K&S 2014
2003	791	K&S 2014
2004	871	K&S 2014
2005	1,135	K&S 2014
2006	930	K&S 2014
2007	991	K&S 2014
2008	1,412	K&S 2014
2009	943	K&S 2014
2010	789	K&S 2014
2011	856	K&S 2014
2012	778	K&S 2014
2013	unk	
2014	unk	
2015	unk	
2016	unk	
2017	910	Staff Report
2018	850	Staff Report
2019	800	Staff Report

A6. Bel Air Greens

1 Well - 04S04E24J1

Well number:	04S04E24J1	
Date drilled:	unknown	
Total depth:	unknown	
Flowrate:	750	gpm
Permit face value:	12.88	AFY
Period of record:	--	
Average production:	--	AFY

Available Production Data

Year	Volume (AF)	Data Source

No available production data

A7. Cathedral Canyon Country Club

2 Wells - 04S05E28F1, 04S05E28M1

Well number:	04S05E28F1
Date drilled:	1973
Total depth:	956 ft
Flowrate:	1,431 gpm
Permit face value:	1,176-1,260 AFY
Period of record:	1976 - 2012
Average production:	1,477 AFY

Available Production Data

Year	Volume (AF)	Data Source
1976	1,550	K&S 2014
1977	1,691	K&S 2014
1978	1,690	K&S 2014
1979	1,630	K&S 2014
1980	1,302	K&S 2014
1981	2,272	K&S 2014
1982	1,128	K&S 2014
1983	1,006	K&S 2014
1984	1,160	K&S 2014
1985	1,279	K&S 2014
1986	1,431	K&S 2014
1987	1,223	K&S 2014
1988	1,446	K&S 2014
1989	1,409	K&S 2014
1990	1,919	K&S 2014
1991	1,338	K&S 2014
1992	1,286	K&S 2014
1993	1,410	K&S 2014
1994	1,382	K&S 2014
1995	1,573	K&S 2014
1996	1,781	K&S 2014
1997	1,796	K&S 2014
1998	1,983	K&S 2014
1999	2,041	K&S 2014
2000	1,958	K&S 2014
2001	2,266	K&S 2014
2002	2,085	K&S 2014
2003	1,562	K&S 2014
2004	1,411	K&S 2014
2005	1,547	K&S 2014
2006	1,618	K&S 2014
2007	1,283	K&S 2014
2008	1,390	K&S 2014
2009	1,133	K&S 2014
2010	600	K&S 2014
2011	531	K&S 2014
2012	538	K&S 2014

Well number:	04S05E28M1
Date drilled:	1973
Total depth:	710 ft
Flowrate:	1,391 gpm
Permit face value:	132-180 AFY
Period of record:	1979 - 2019
Average production:	1,276 AFY

Available Production Data

Year	Volume (AF)	Data Source
1979	308	K&S 2014
1980	1,058	K&S 2014
1981	1,247	K&S 2014
1982	1,036	K&S 2014
1983	1,015	WY 1985-15
1984	1,177	WY 1985-15
1985	1,419	WY 1985-15
1986	1,391	WY 1985-15
1987	1,919	WY 1985-15
1988	3,282	WY 1985-15
1989	2,065	WY 1985-15
1990	1,696	WY 1985-15
1991	1,657	DWA
1992	1,936	DWA
1993	1,193	DWA
1994	1,418	DWA
1995	1,038	DWA
1996	2,028	DWA
1997	2,209	DWA
1998	1,675	DWA
1999	1,801	DWA
2000	1,238	DWA
2001	1,188	DWA
2002	1,674	DWA
2003	1,719	DWA
2004	1,488	DWA
2005	1,064	DWA
2006	1,483	DWA
2007	1,910	DWA
2008	1,846	DWA
2009	1,454	DWA
2010	175	DWA
2011	523	DWA
2012	661	DWA
2013	656	DWA
2014	588	DWA
2015	349	DWA
2016	667	DWA
2017	344	DWA
2018	570	DWA
2019	149	DWA

Note: DWA data received via file transfer August 15, 2019 after Public Records Act request filed July 15, 2019.

Appendix B

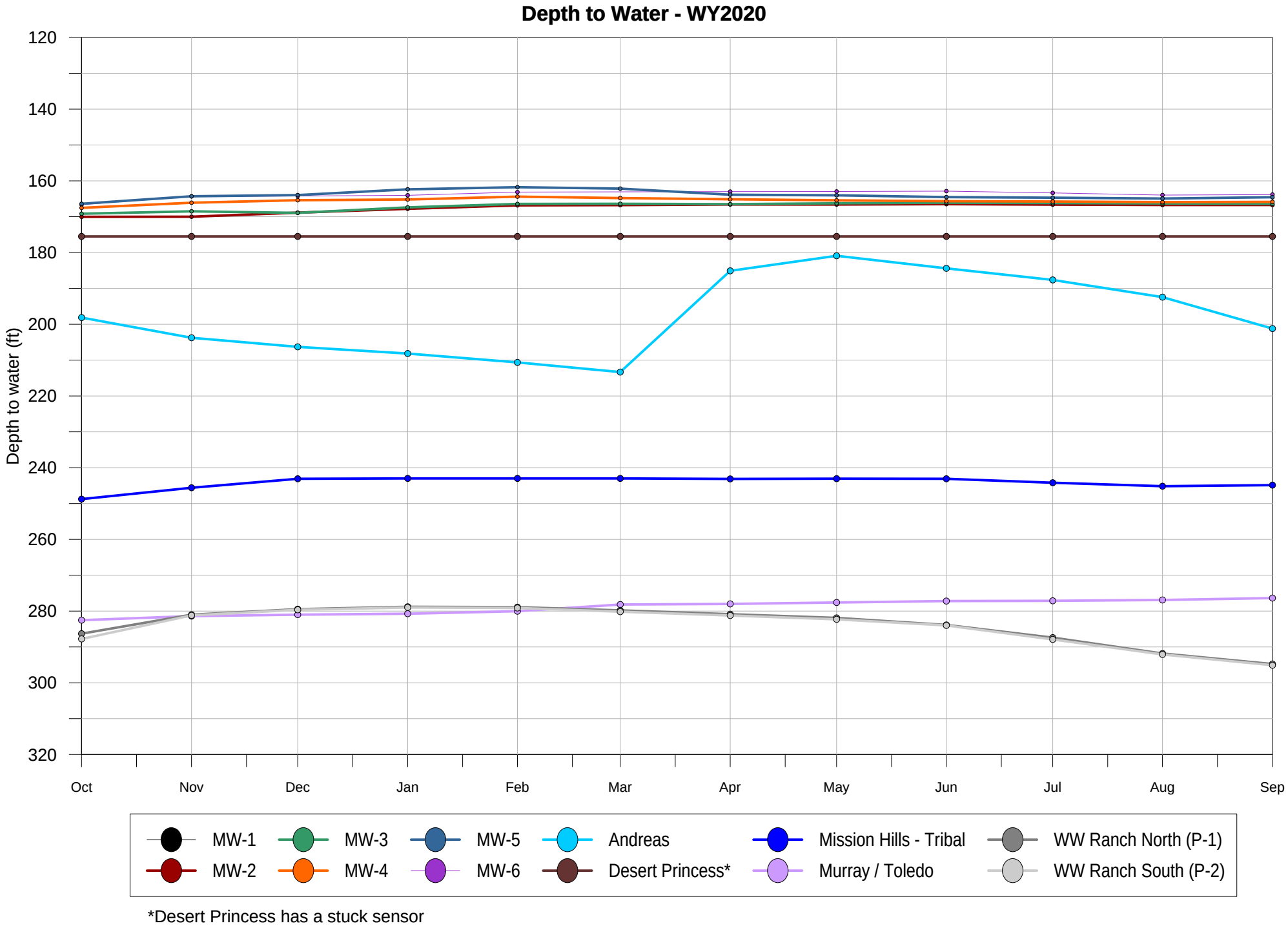
THEISSEN POLYGON STORAGE CHANGES

TABLE B-1. THEISSEN POLYGON STORAGE CHANGES

							Oct-2019				Oct-2020				Change	
Polygon #	**Measurement Point**	**Surface Elevation (ft amsl)**	**Recoverable depth (ft)**	**Specific Yield**	**Total Area (acres)**	**Reservation Area (acres)**	**Depth to Water (ft)**	**Saturated thickness above 1000ft (ft)**	**Total Usable Storage (AF)**	**On Reservation Storage (AF)**	**Depth to Water (ft)**	**Saturated thickness above 1000ft (ft)**	**Total Usable Storage (AF)**	**On Reservation Storage (AF)**	**Total (AF)**	**On Reservation (AF)**
1	Well 26	1349	1000	0.15	3046	0	194.5	806	368,044	-	193.6	806	368,423	-	379	-
2	WW Ranch South P-1 & P-2	1168	1000	0.15	10784	253	287.0	713	1,153,251	27,057	294.9	705	1,140,456	26,757	(12,795)	(300)
3	USGS 335339116345302	798	1000	0.15	14956	753	220.4	780	1,748,976	88,039	214.0	786	1,763,334	88,762	14,358	723
4	Well 9	530	1000	0.15	13577	2362	221.0	779	1,586,600	276,026	214.3	786	1,600,184	278,389	13,584	2,363
5	Well 6	433	1000	0.15	5742	2749	209.2	791	681,138	326,087	196.8	803	691,792	331,188	10,654	5,101
6	ICGR South Course	526	630	0.13	961	910	286.2	344	42,948	40,679	287.2	343	42,823	40,560	(125)	(118)
7	Andreas	582	630	0.13	1224	1018	198.1	432	68,719	57,178	201.2	429	68,231	56,771	(488)	(406)
8	Well 15	530	630	0.13	310	282	287.0	343	13,806	12,554	288.0	342	13,766	12,517	(40)	(37)
9	Murray / Toledo	501	1000	0.15	2705	1329	282.5	717	291,112	142,995	276.4	724	293,620	144,227	2,508	1,232
10	04S05E09B001S	388	1000	0.15	11644	2851	193.5	807	1,408,749	344,949	183.3	817	1,426,484	349,292	17,735	4,343
11	04S05E27E001S	307	1000	0.15	2934	1352	183.7	816	359,196	165,551	176.7	823	362,280	166,973	3,083	1,421
12	Well 19	290	1000	0.15	3058	1336	167.0	833	382,058	166,909	159.7	840	385,384	168,361	3,325	1,453
13	04S05E15R002S	345	1000	0.15	4328	2009	217.4	783	508,064	235,784	212.0	788	511,566	237,409	3,502	1,625
14	04S06E18R001S	231	1000	0.15	6719	70	182.7	817	823,663	8,556	178.2	822	828,198	8,603	4,535	47
15	MW-1-6	231	1000	0.15	3836	1291	167.9	832	478,712	161,103	165.5	835	480,126	161,579	1,414	476
16	Mission Hills - Tribal	367	1000	0.15	1684	738	248.8	751	189,761	83,128	244.9	755	190,744	83,559	983	430
17	04S05E35G003S	262	1000	0.15	3792	518	189.4	811	461,009	62,968	183.6	816	464,308	63,418	3,299	451
18	05S06E06Q001S	210	1000	0.15	6381	0	197.5	802	768,065	-	193.3	807	772,085	-	4,020	-
19	04S06E22C001S	210	1000	0.15	5342	0	203.2	797	638,434	-	201.7	798	639,636	-	1,202	-
20	04S06E35P001S	142	1000	0.15	6598	0	175.3	825	816,232	-	169.3	831	822,170	-	5,938	-
21	05S06E18R001S	181	1000	0.15	4211	0	194.7	805	508,629	-	190.1	810	511,534	-	2,905	-
22	05S06E29C001S	330	1000	0.15	8335	0	357.9	642	802,762	-	345.0	655	818,890	-	16,128	-
23	04S06E25J002S	150	1000	0.15	5186	0	160.1	840	653,383	-	162.6	837	651,438	-	(1,945)	-
24	05S06E13D001S	164	1000	0.15	4678	0	219.6	780	547,612	-	212.8	787	552,384	-	4,772	-
25	05S06E13G002S	147	1000	0.15	3931	0	204.1	796	469,270	-	199.9	800	471,737	-	2,467	-
	Total				**135,958**	**19,819**			**15,770,192**	**2,199,563**			**15,871,591**	**2,218,365**	**101,398**	**18,802**
	Average						**218**	**738**			**214**	**742**				

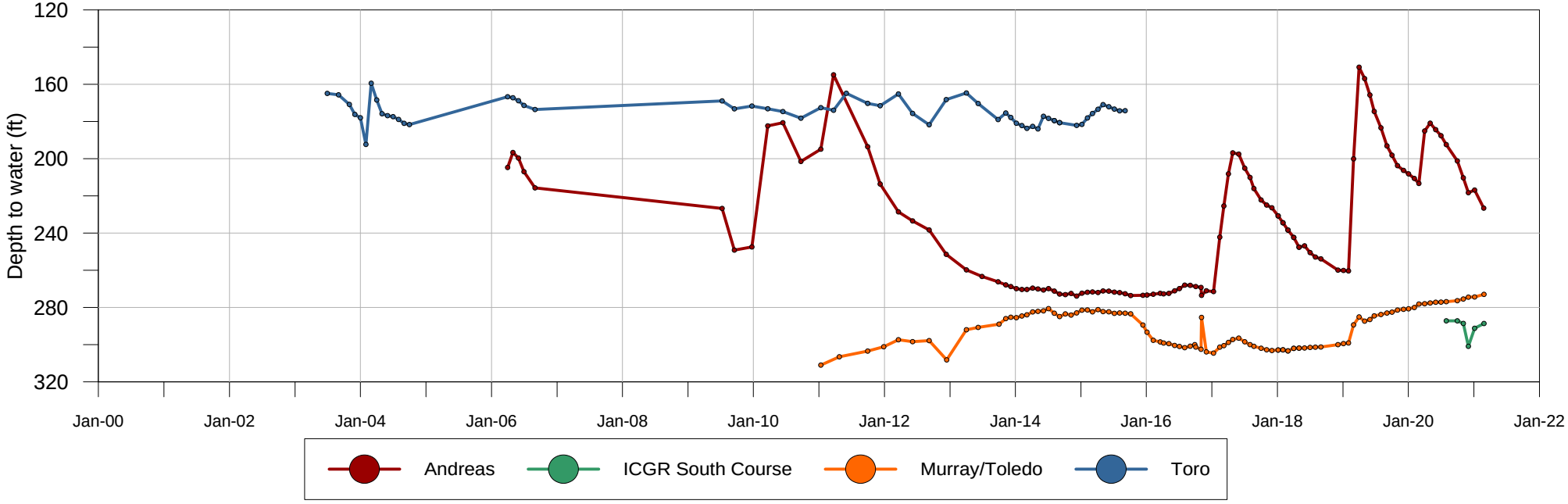
Appendix C

GROUNDWATER LEVELS ON ACIR AT ACWA-MONITORED WELLS

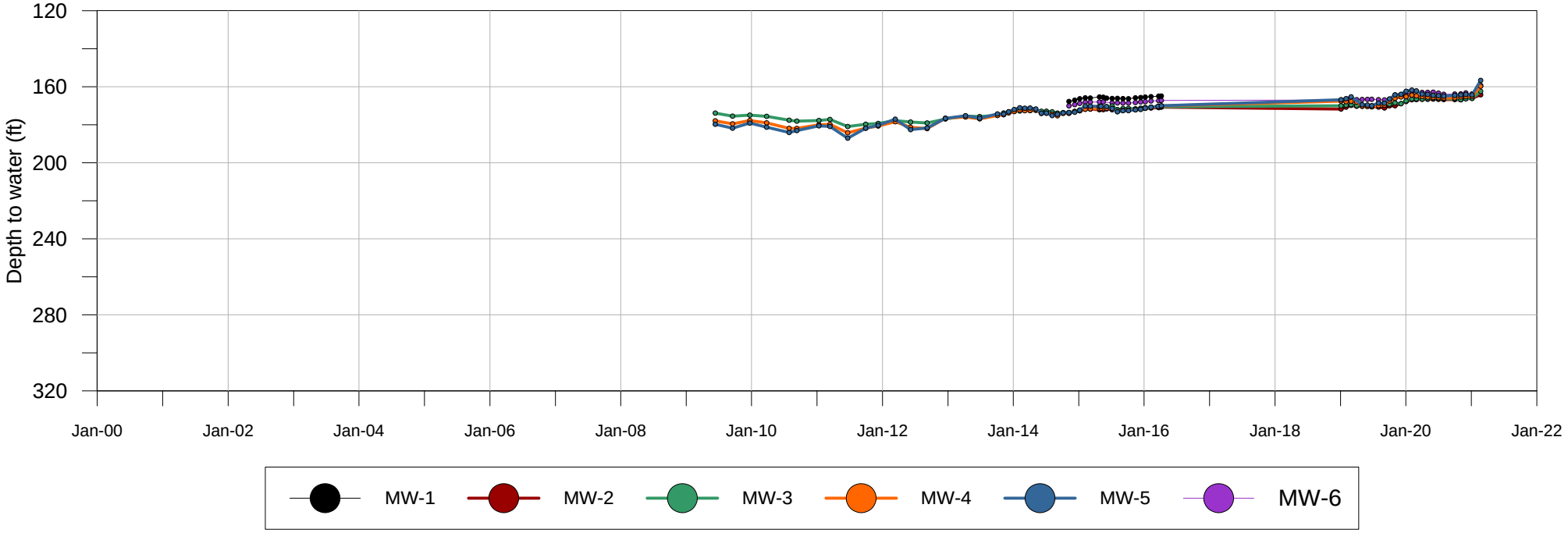


*Desert Princess has a stuck sensor

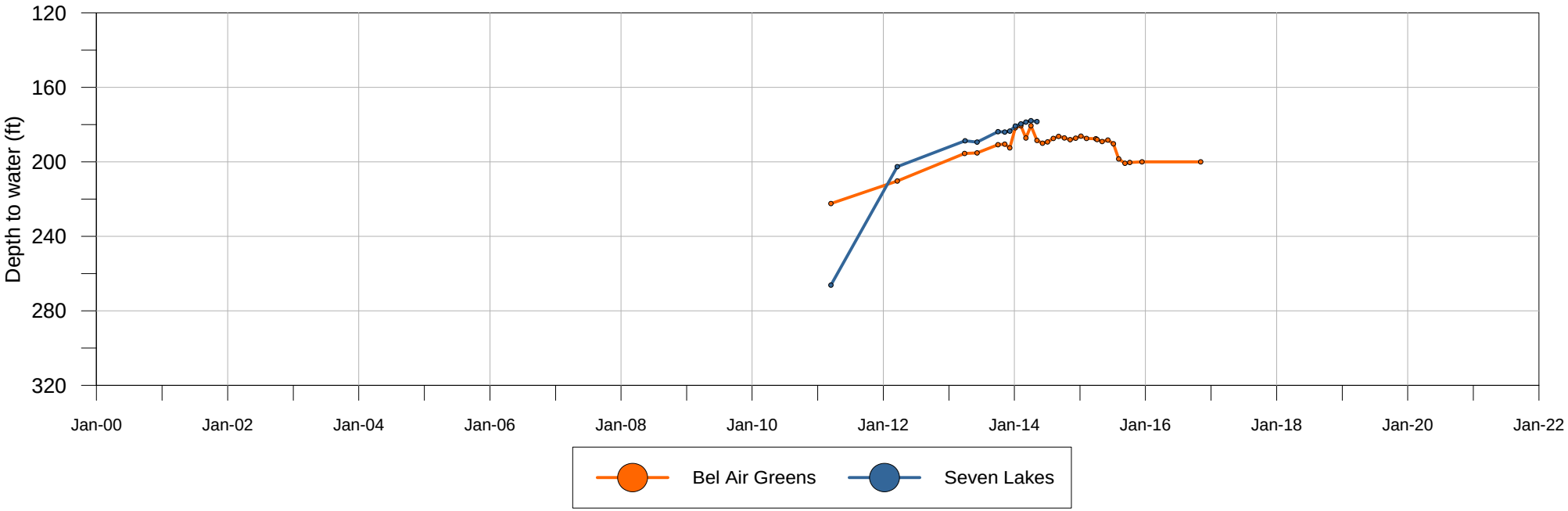
Depth to Water - Palm Canyon Area



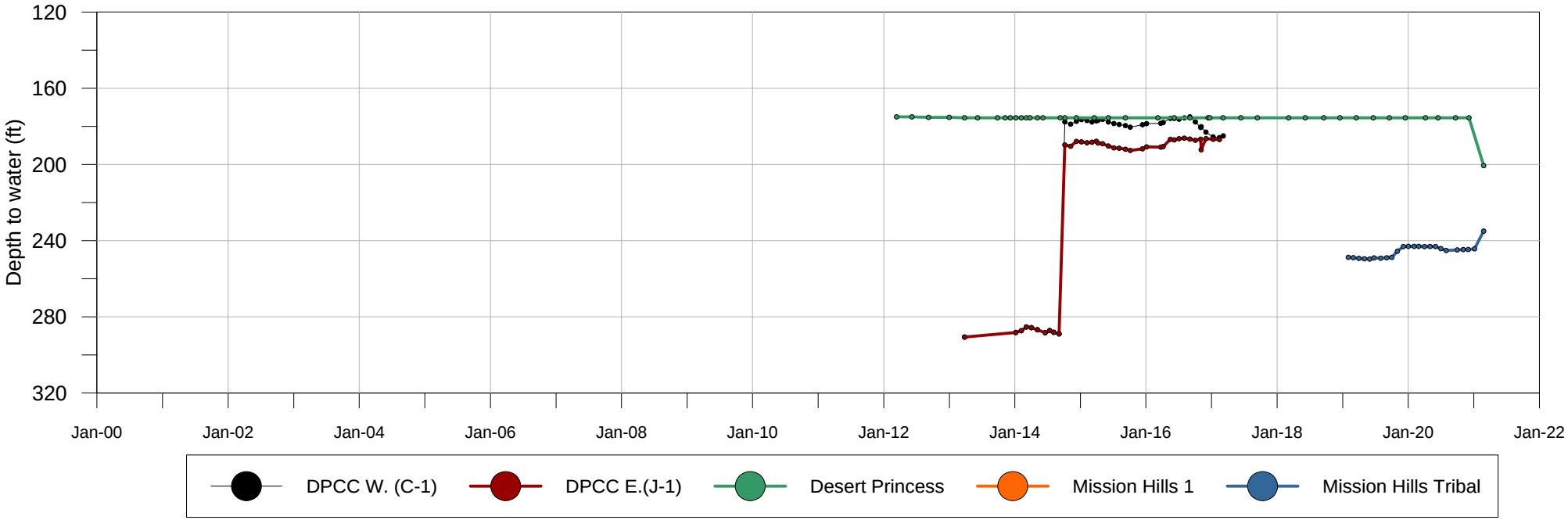
Depth to Water - Tahquitz Canyon Area



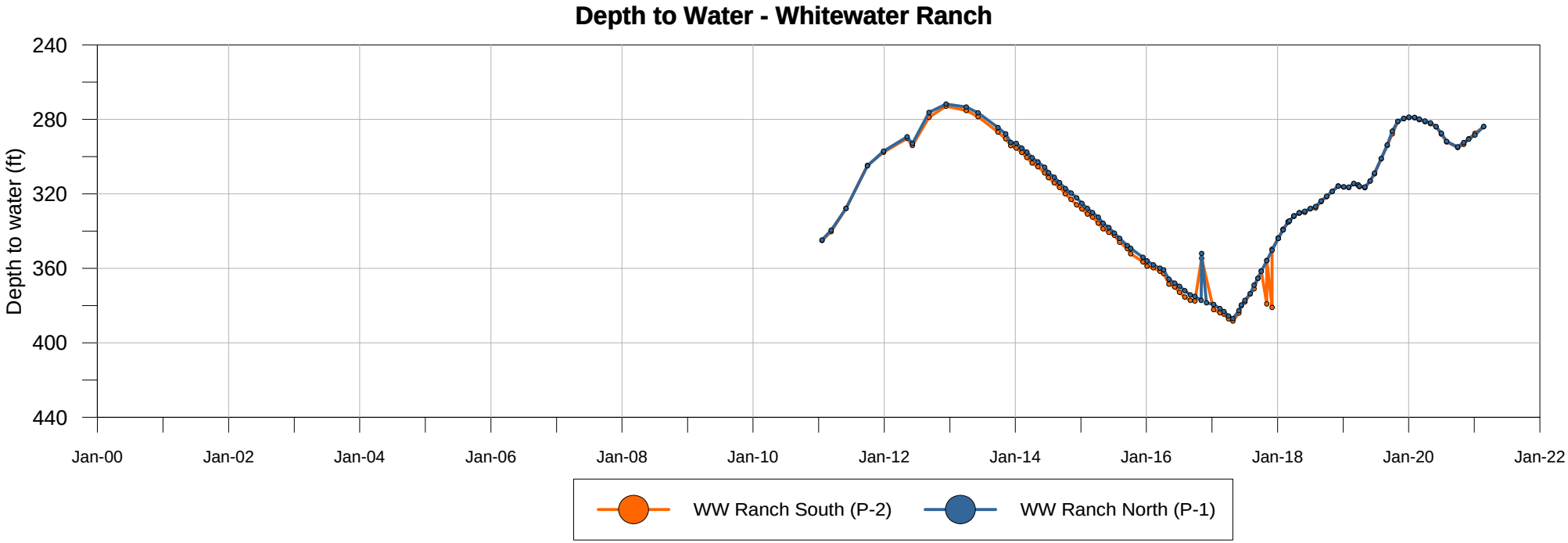
Depth to Water - Seven Lakes Area



Depth to Water - Mission Hills Area



Stuck Sensors: DPCC E. (J-1) from 3/7/2017 to 1/1/2021, DPCC W. (C-1) from 3/1/2017 to 1/1/2021,Desert Princess from 11/8/2013 to 12/4/2020


Depth to Water - Whitewater Ranch
Depth to water (ft)
240
280
320
360
400
440
Jan-00
Jan-02
Jan-04
Jan-06
Jan-08
Jan-10
Jan-12
Jan-14
Jan-16
Jan-18
Jan-20
Jan-22
WW Ranch South (P-2)
WW Ranch North (P-1)

Appendix D

GROUNDWATER QUALITY ON ACIR AT ACWA-MONITORED WELLS

2.3 Groundwater Quality

General Minerals

The following Tables 2 – 6 summarize recent, currently available data regarding certain important groundwater quality constituents in certain monitored wells. Once the ACWA has its permitting process in place, it will have more comprehensive information regarding groundwater quality.

Table 2: TDS Summary

Sampling Location	Depth	2013	2014	2015	2016	2017	2018	2019	Average	Comment
Bel Air Greens	NA	250	260	250	NA	NA	NA	NA	253	
Desert Princess	1,100	440	540	490	490	530	420	460	481	
Mission Hills 1	1,385	160	280	NA	240	190	190	170	205	
ACC MW-1	1,016	200	200	190	200	200	220	200	201	
ACC MW-2	516	250	260	260	250	270	290	290	267	
ACC MW-3	240	370	430	410	560	600	690	660	531	Increasing
WWR - N	776	250	250	NA	260	250	290	250	258	
WWR - S	906	230	240	260	290	259	230	230	248	
DPCC - E	500	440	390	340	390	390	400	390	391	
DPCC - W	500	410	450	410	440	480	430	470	441	
Average Well		300	330	326	347	352	351	347		

MCL: 1000 mg/L
Secondary MCL (Aesthetics Based): 500 mg/L

Table 3: Calcium Summary

Sampling Location	Depth	2013	2014	2015	2016	2017	2018	2019	Average	Comment
Bel Air Greens	NA	45	46	46	NA	NA	NA	NA	46	
Desert Princess	1,100	84	97	94	93	91	84	88	90	
Mission Hills 1	1,385	31	44	NA	40	37	30	28	35	
ACC MW-1	1,016	37	36	38	38	35	32	35	36	
ACC MW-2	516	54	52	59	57	54	53	62	56	
ACC MW-3	240	85	89	98	120	125	120	130	110	Increasing
WWR - N	776	52	56	NA	60	35	54	50	51	
WWR - S	906	47	52	50	58	52	45	47	50	
DPCC - E	500	NA	75	70	75	73	73	72	73	
DPCC – W	500	NA	77	73	83	83	88	83	81	
Average Well		54	62	66	69	65	64	66		

MCL: N/A
Secondary MCL: N/A

Table 4: Chloride Summary										
Sampling Location	**Depth**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**Average**	**Comment**
Bel Air Greens	NA	20	20	19	NA	NA	NA	NA	20	
Desert Princess	1,100	41	56	52	51	48	44	46	48	
Mission Hills 1	1,385	8.7	19	NA	8	9	9.5	6.8	10	
ACC MW-1	1,016	8.5	8.3	5.9	8.1	6.8	8.2	5.8	7	
ACC MW-2	516	13	13	12	13	15	16	19	14	
ACC MW-3	240	31	35	41	52	62	65	69	51	Increasing
WWR - N	776	12	14	NA	12	13	9.9	9.9	12	
WWR - S	906	9.9	11	11	11	11	9.8	7.2	10	
DPCC - E	500	NA	39	39	40	42	43	47	42	
DPCC - W	500	NA	62	59	63	68	69	74	66	
Average Well		18	28	30	29	31	30	32		
MCL: 500 Secondary MCL (Aesthetics Based): N/A										

Table 5: Sodium Summary										
Sampling Location	**Depth**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**Average**	**Comment**
Bel Air Greens	NA	25	26	27	NA	NA	NA	NA	26	
Desert Princess	1,100	27	26	28	28	29	29	30	28	
Mission Hills 1	1,385	26	24	NA	23	24	25	21	24	
ACC MW-1	1,016	27	25	27	24	26	25	28	26	
ACC MW-2	516	21	19	22	22	21	21	22	21	
ACC MW-3	240	25	23	26	27	28	29	28	27	
WWR - N	776	21	20	NA	21	23	23	19	21	
WWR - S	906	21	21	20	22	22	22	19	21	
DPCC - E	500	NA	31	29	31	32	30	27	30	
DPCC - W	500	NA	45	41	44	44	44	42	43	
Average Well		24	26	28	27	28	28	26		
MCL: N/A Secondary MCL (Aesthetics Based): N/A										

Table 6: Sulfate Summary										
Sampling Location	**Depth**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**Average**	**Comment**
Bel Air Greens	NA	37	42	44	NA	NA	NA	NA	41	
Desert Princess	1,100	140	200	180	170	160	150	150	164	
Mission Hills 1	1,385	15	41	NA	20	19	15	15	21	
ACC MW-1	1,016	25	25	24	24	25	25	24	25	
ACC MW-2	516	51	55	58	60	65	71	80	63	
ACC MW-3	240	76	85	100	130	150	170	180	127	Increasing
WWR - N	776	22	24	NA	23	23	22	21	23	
WWR - S	906	19	23	23	23	21	18	18	21	
DPCC - E.	500	65	55	54	55	57	57	59	57	
DPCC - W	500	57	67	66	71	75	76	78	70	
Average Well		51	62	69	64	66	67	69		
MCL: 500 Secondary MCL (Aesthetics Based): N/A										