HYDROLOGIC DATA BRIEF FOR THE EDWARDS AQUIFER THROUGH AUGUST 2016

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September 7, 2016

UVALDE COUNTY RAINFALL (in inches) for 2016

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2016)	0.86	1.60	0.68	1.99	7.21	3.01	1.48	7.37				
Historical Monthly Avg	1.13	1.24	1.32	2.36	3.16	2.83	1.95	2.16	2.60	2.57	1.41	1.34
Difference	**-0.27**	**0.36**	**-0.64**	**-0.37**	**4.05**	**0.18**	**-0.47**	**5.21**				

Historical Yearly Average	**24.07**
Total for January - August 2016	**24.20**
Historical Average January - August	**16.15**
Total Difference for Year to Date	**8.05**
Percent of Average Year to Date	**150%**

Data from EAA rain gauge UV033 located 4.4 miles south of the City of Uvalde.

MEDINA COUNTY RAINFALL (in inches) for 2016

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	* Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2016)	0.54	1.42	1.51	2.87	6.95	1.74	1.56	6.35				
Historical Monthly Avg	1.43	1.94	1.53	2.66	3.79	3.38	1.88	2.76	3.00	3.03	1.73	1.43
Difference	**-0.89**	**-0.52**	**-0.02**	**0.21**	**3.16**	**-1.64**	**-0.32**	**3.59**				

Historical Yearly Average	**28.56**
Total for January - August 2016	**22.94**
Historical Average January - August	**19.37**
Total Difference for Year to Date	**3.57**
Percent of Average Year to Date	**118%**

* ME003 data substituted for NWS rainfall station at Hondo Airport due to technical issues at Hondo Airport Gauge.

Data from National Weather Service (NWS) rainfall station at Hondo Airport.

BEXAR COUNTY RAINFALL (in inches) for 2016

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2016)	1.38	1.55	3.56	6.19	9.14	2.39	0.33	4.91				
Historical Monthly Avg	1.61	1.90	1.68	2.53	3.99	3.57	1.83	2.58	3.29	3.29	2.11	1.72
Difference	**-0.23**	**-0.35**	**1.88**	**3.66**	**5.15**	**-1.18**	**-1.50**	**2.33**				

Historical Yearly Average	**30.10**
Total for January - August 2016	**29.45**
Historical Average January - August	**19.69**
Total Difference for Year to Date	**9.76**
Percent of Average Year to Date	**150%**

Data from NWS rainfall station located at San Antonio International Airport.

COMAL COUNTY RAINFALL (in inches) for 2016

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2016)	1.00	1.01	2.76	4.42	5.60	2.00	3.12	5.31				
Historical Monthly Avg	2.36	2.09	1.92	2.68	4.86	4.64	2.02	2.16	3.39	3.84	2.79	2.75
Difference	**-1.36**	**-1.08**	**0.84**	**1.74**	**0.74**	**-2.64**	**1.10**	**3.15**				

Historical Yearly Average	**35.50**
Total for January - August 2016	**25.22**
Historical Average January - August	**22.73**
Total Difference for Year to Date	**2.49**
Percent of Average Year to Date	**111%**

Data from NWS rainfall station located in New Braunfels.

HAYS COUNTY RAINFALL (in inches) for 2016

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	* Aug.	Sept.	Oct.	Nov.	Dec.
Monthly Rainfall (2016)	0.96	1.37	1.84	0.97	6.95	1.57	1.64	4.13				
Historical Monthly Avg	2.00	2.93	1.84	3.29	3.68	3.56	1.77	2.31	4.52	3.61	2.23	2.01
Difference	**-1.04**	**-1.56**	**0.00**	**-2.32**	**3.27**	**-1.99**	**-0.13**	**1.82**				

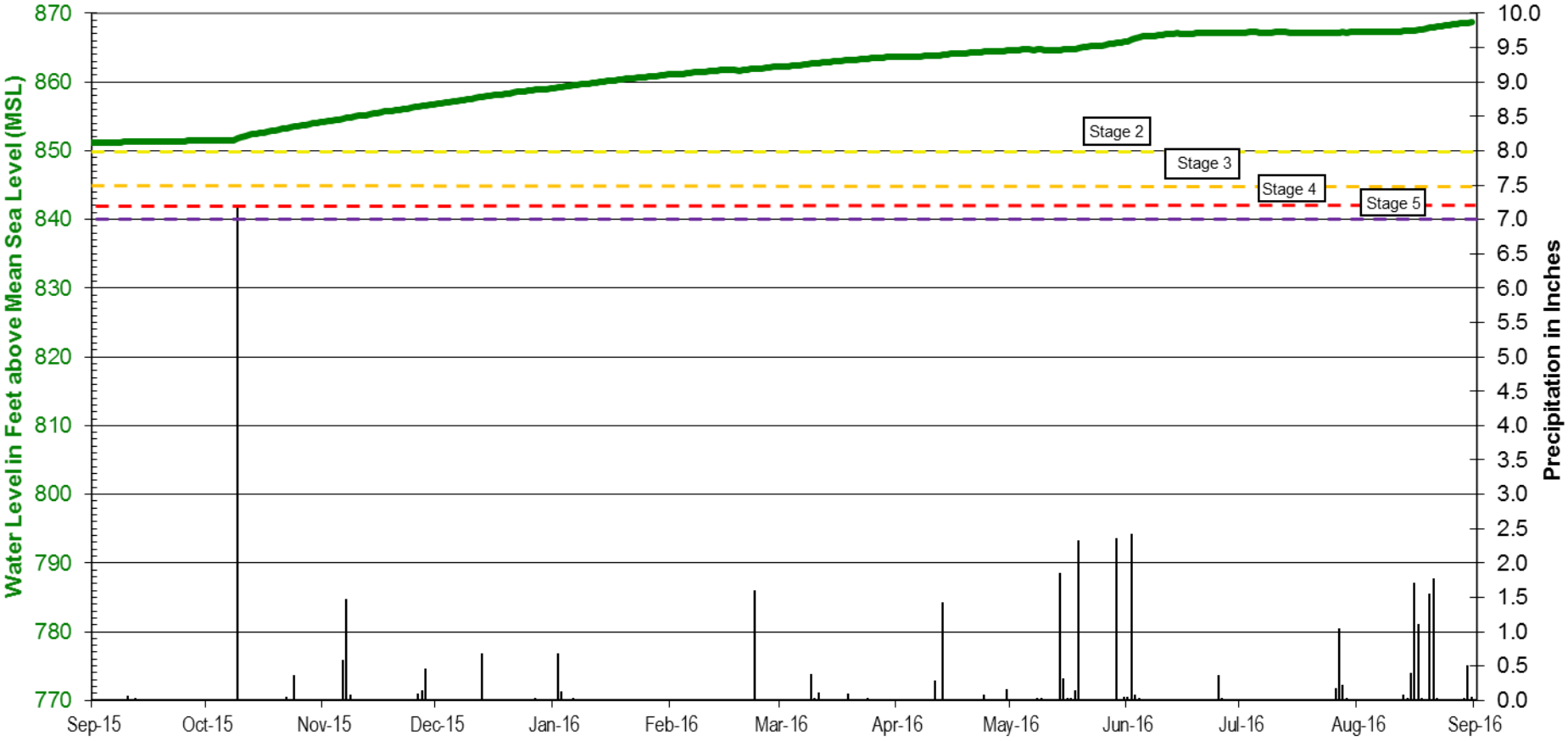
Historical Yearly Average	**33.75**
Total for January - August 2016	**19.43**
Historical Average January - August	**21.38**
Total Difference for Year to Date	**-1.95**
Percent of Average Year to Date	**91%**

* HA157 data substituted for HA158 due to technical issues at HA158.

Data provided by EAA rain gauge HA158 located 0.25 miles west of Bobcat Stadium.
FAA Rainfall Station: San Marcos Airport - out of service.

Hydrograph of the Uvalde County Index Well (J-27) and Precipitation at Uvalde

(EAA Rain Gauge: UV033 located 4.4 miles south of the City of Uvalde)



Stage 1 - None
Stage 2 - Critical Period - 10-day avg. < 850' MSL
Stage 3 - Critical Period - 10-day avg. < 845' MSL
Stage 4 - Critical Period - 10-day avg. < 842' MSL
Stage 5 - Critical Period - 10-day avg. < 840' MSL

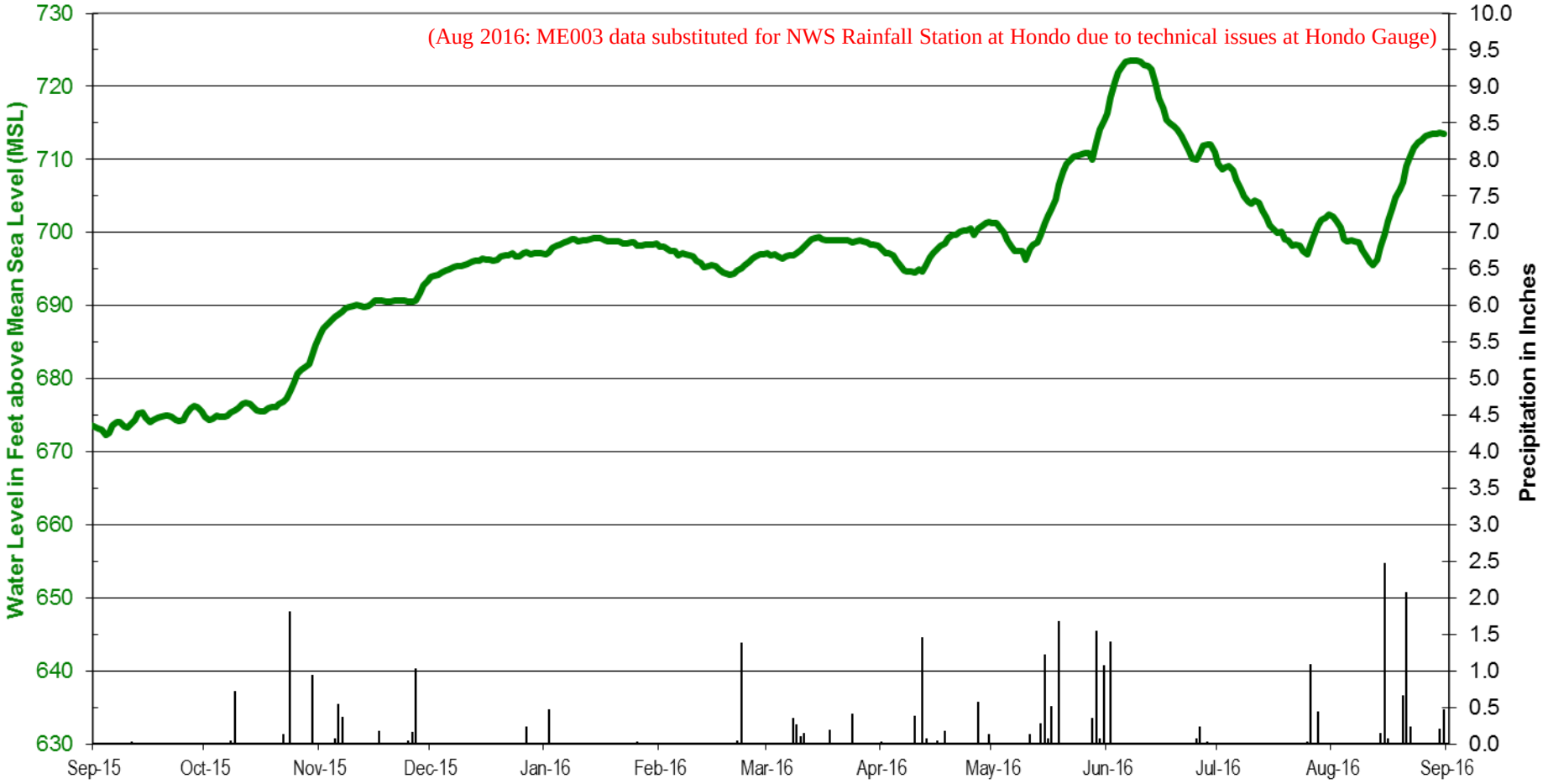
Date

Historical High - 889' MSL (6/15/87)
Historical Low - 811' MSL (4/13/57)

J-27 Water Level Precipitation at Uvalde

Hydrograph of the Medina County Hondo City Well and Precipitation at Hondo

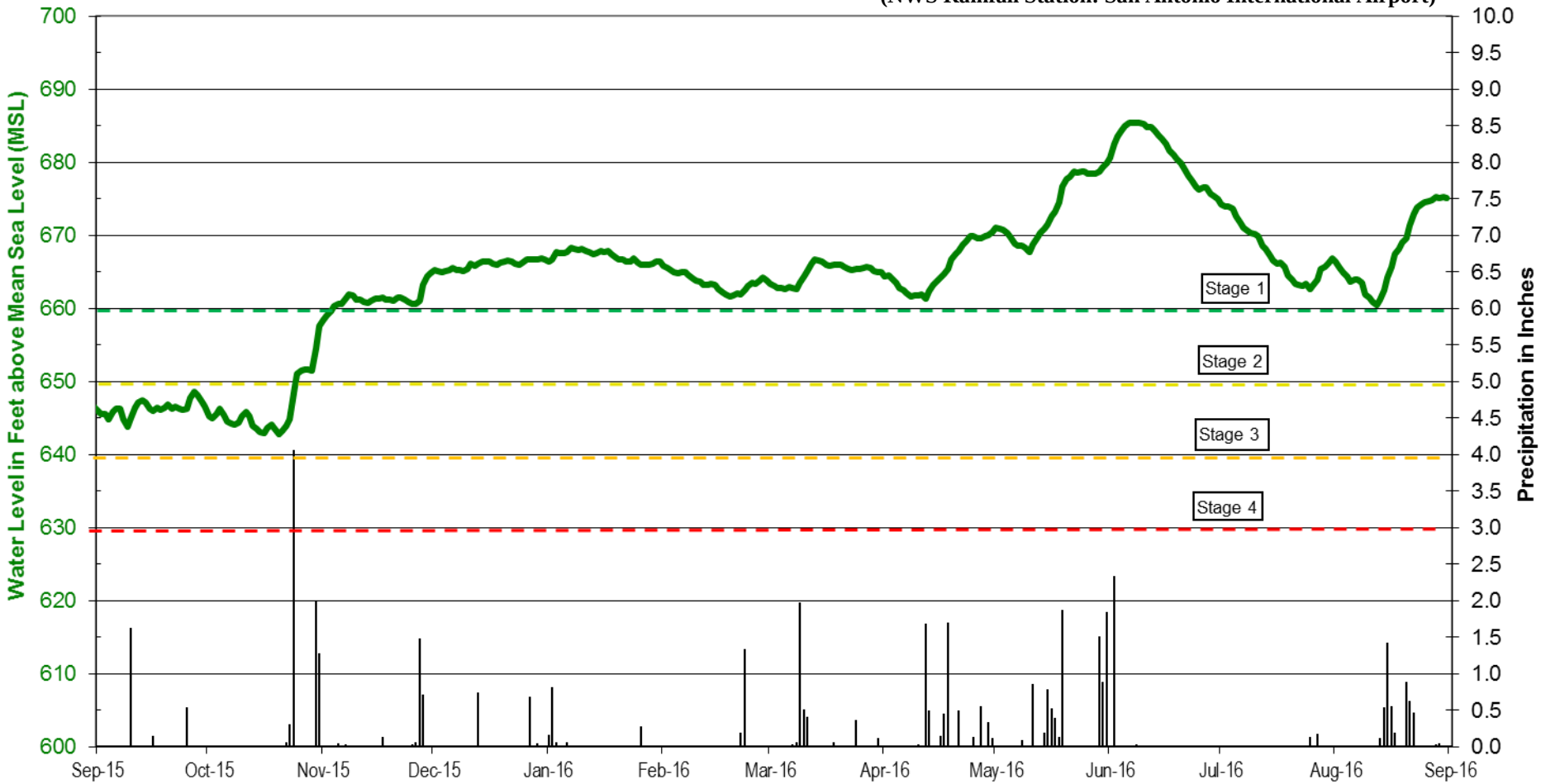
(NWS Rainfall Station: Hondo)



CPM in Medina County is triggered by:
the10-day average water level at J-17 or
the10-day average springflow at Comal Springs or at San Marcos Springs

Hydrograph of the Bexar County Index Well (J-17) and Precipitation at San Antonio

(NWS Rainfall Station: San Antonio International Airport)



Stage 1 - Critical Period - 10-day avg. < 660' MSL
Stage 2 - Critical Period - 10-day avg. < 650' MSL
Stage 3 - Critical Period - 10-day avg. < 640' MSL
Stage 4 - Critical Period - 10-day avg. < 630' MSL
Stage 5 - Critical Period - 10-day avg. < 625' MSL

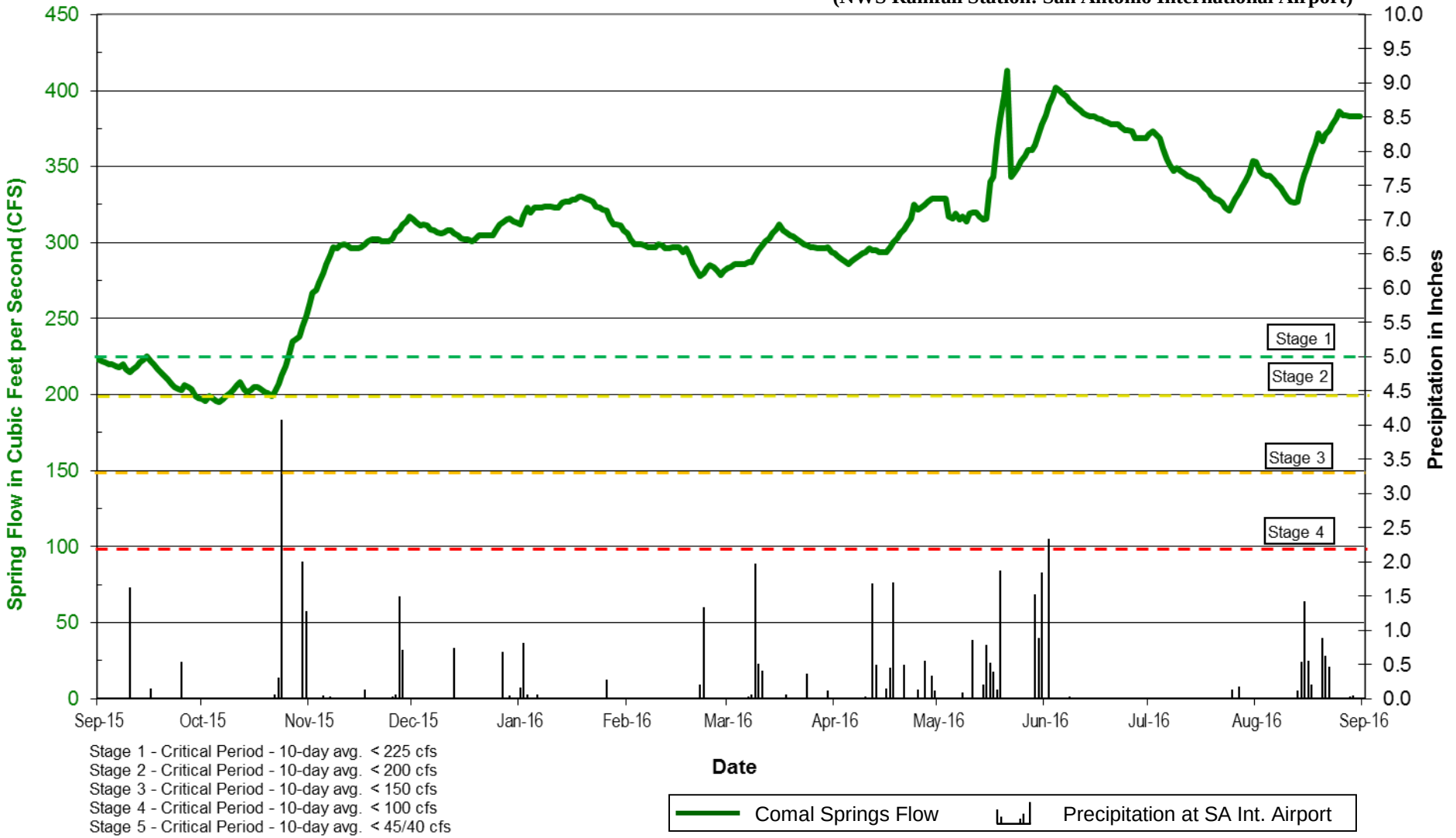
Historical High - 703.3' MSL (6/14/92)
Historical Low - 612.5' MSL (8/17/56)

J-17 Water Level

Precipitation at SA Int. Airport

Hydrograph of the Comal Springs Discharge and Precipitation at San Antonio

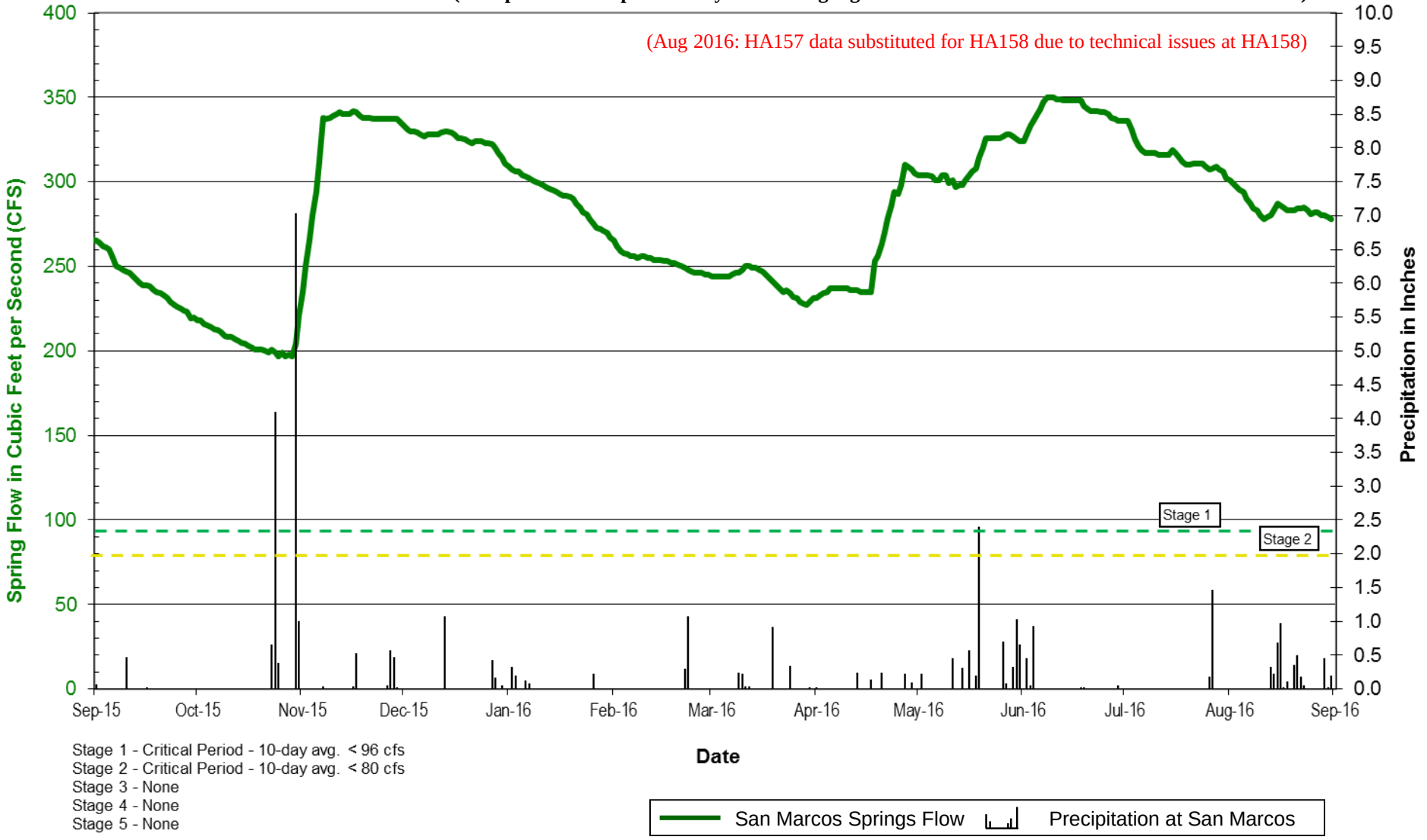
(NWS Rainfall Station: San Antonio International Airport)



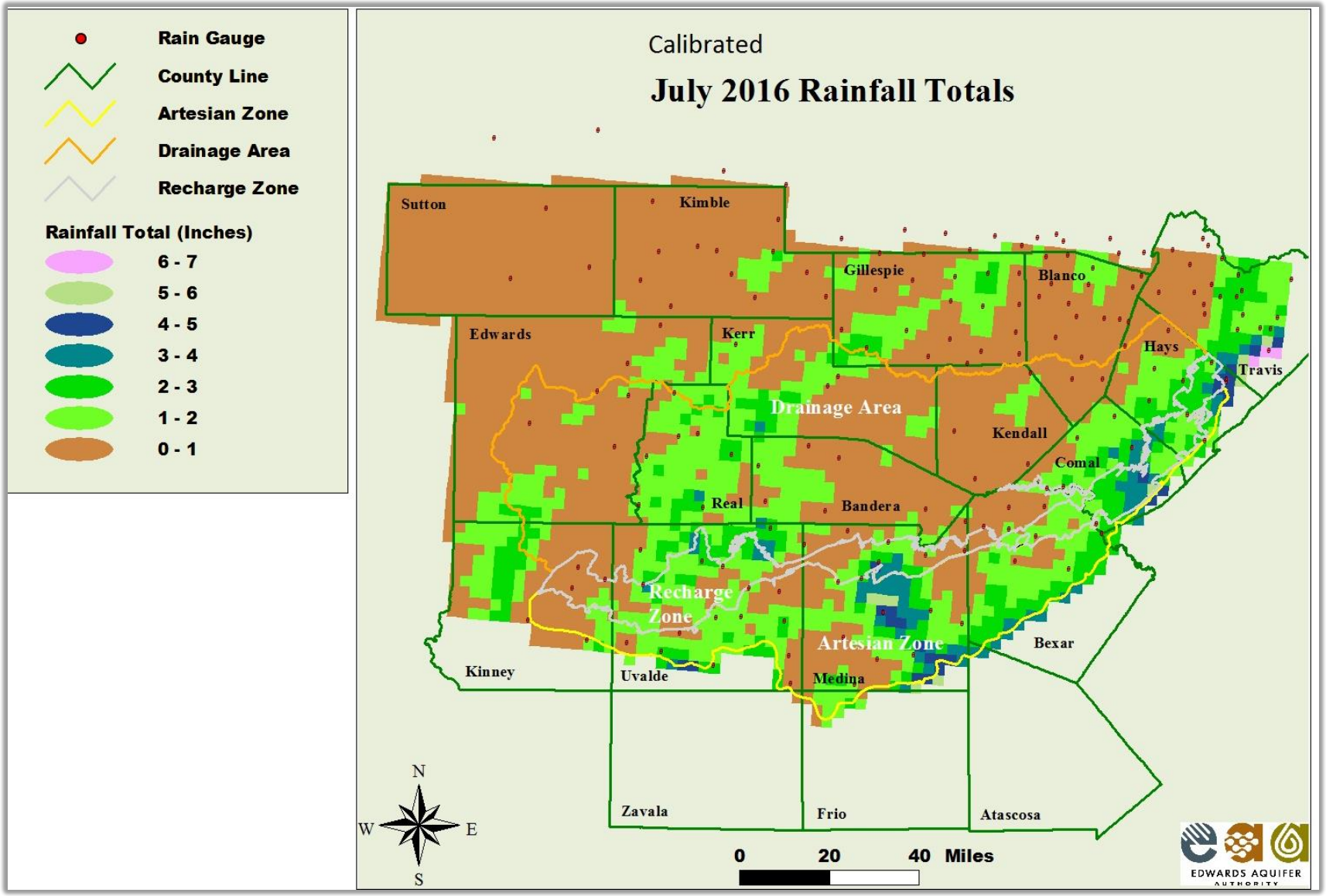
Stage 1 - Critical Period - 10-day avg. < 225 cfs
Stage 2 - Critical Period - 10-day avg. < 200 cfs
Stage 3 - Critical Period - 10-day avg. < 150 cfs
Stage 4 - Critical Period - 10-day avg. < 100 cfs
Stage 5 - Critical Period - 10-day avg. < 45/40 cfs

Hydrograph of the San Marcos Springs Discharge and Precipitation at San Marcos

(Precipitation data provided by EAA rain gauge HA158 located 0.25 miles west of Bobcat Stadium)



Stage 1 - Critical Period - 10-day avg. < 96 cfs
Stage 2 - Critical Period - 10-day avg. < 80 cfs
Stage 3 - None
Stage 4 - None
Stage 5 - None


Rain Gauge
County Line
Artesian Zone
Drainage Area
Recharge Zone
Rainfall Total (Inches)
6 - 7
5 - 6
4 - 5
3 - 4
2 - 3
1 - 2
0 - 1
Calibrated
July 2016 Rainfall Totals
Sutton
Kimble
Gillespie
Blanco
Edwards
Kerr
Hays
Travis
Drainage Area
Kendall
Comal
Real
Bandera
Recharge Zone
Artesian Zone
Bexar
Kinney
Uvalde
Medina
Zavala
Frio
Atascosa
N
W
E
S
0 20 40 Miles
EDWARDS AQUIFER AUTHORITY

Real-time Precipitation Gauging System and Hydrologic Data Collection

The Edwards Aquifer Authority (EAA) operates 74 "real-time" precipitation gauges that record data on six-minute intervals and transmit these data to the EAA's office via a radio-telemetry system. Rain gauges are located on the Edwards Aquifer Contributing Zone, Recharge Zone, and Artesian Zone. Acquired data have many uses including aquifer recharge calculations, production of rainfall maps, and in a variety of research projects. The EAA also collects water level data from a series of aquifer monitor wells in the region, including two index wells: Well J-27, in Uvalde County and Well J-17, in Bexar County. Water level data from the Hondo City well in Medina County are also included in this data brief. Through a cooperative agreement with the U.S. Geological Survey, the EAA monitors the discharge at Comal Springs and San Marcos Springs.

Rainfall Evaluation – July 2016 Vieux & Associates Doppler Rainfall Map

The calibrated July 2016 Rainfall Totals Map was prepared by Vieux & Associates for the EAA using NEXRAD Doppler Radar and the EAA's precipitation gauge data. Calibrating the NEXRAD data with the EAA's precipitation gauge data improves the accuracy of the precipitation map and is calculated using a four-kilometer grid system. Rain gauge locations are indicated on the map.

As summer progressed, the hot and dry weather of July brought fewer widely scattered light showers with fewer intense storms. The heaviest rainfall totals occurred in only a few pockets across the Edwards Aquifer system. The entire Contributing Zone (Drainage Area) received between 0 and 4 inches. However, locally intense storms in southwest Kerr, south-central Real, and east-central Comal Counties recorded between 2 and 4 inches. Along the Recharge Zone / Contributing Zone boundary in northeast Uvalde and central Comal County recorded rainfall totaled between 3 and 5 inches. The entire Recharge Zone recorded between 0 and 5 inches of rainfall. Many areas of the Artesian Zone received beneficial rainfall as between 0 and 6 inches was recorded (the most intense storm total occurred in central Medina County where 3 to 6 inches was recorded).

Rain Evaluation – August 2016 Precipitation Gauge Data

Good summer storms caused all areas to receive above average rainfall in the month of August. As such, the August 2016 maximum monthly total rainfall amounts in the EAA's gauges ranged from 1.38 to 9.97 inches. The highest reported 24-hour rainfall event from the EAA's precipitation gauge network in August, by county, were as follows: Bandera, 1.80 inches; Bexar, 2.59 inches; Blanco, 2.06 inches; Comal, 2.02 inches; Edwards, 2.85 inches; Hays, 1.83 inches; Kendall, 1.70 inches; Kinney, 3.22 inches; Medina, 2.69 inches; Real, 2.47 inches; and Uvalde County, 2.92 inches. The highest 24-hour rain event recorded in the region was 3.22 inches of rain that occurred on August 20 at a gauge located on the south side of RM334, 8.5 miles from the intersection of Tularosa Rd (FM3199) and RM334 in Kinney County.

Evaluation of August 2016 Aquifer Levels and Spring Discharge

In contrast to July, August produced above average rainfall across the area. As a result, aquifer levels and springflow discharges responded accordingly. The San Antonio Pool Index Well (J-17) *increased* 8.3 feet to 675.1 feet above mean sea level (msl) while the City of Hondo Well *increased* 11.1 feet to 713.5 feet msl. The Uvalde Pool Well (J-27), *increased* 1.4 feet to 868.7 feet msl.

The August daily average springflow for Comal Springs, *increased* 29 cubic feet per second (cfs) to 383 cfs, which is 122 cfs *above* the August monthly average discharge of 261 cfs. However, the daily average springflow for San Marcos Springs *decreased* 24 cfs to 278 cfs, which is still 108 cfs *above* the monthly average discharge of 170 cfs for August. Please note that the discharge amounts are estimates and may be adjusted up or down as more direct flow measurements are obtained.

Summary of Current Aquifer Levels and Spring Discharge

The official daily high water level for the Uvalde Pool Well (J-27) was 869.1 ft. msl on September 7, 2016, which is 2.8 ft. *above* the J-27 September monthly average of 866.3 ft. msl. The daily high water level at the San Antonio Pool Index Well (J-17) was 675.6 ft. msl on September 7, 2016; 15.3 ft. *above* the J-17 September monthly average of 660.3 ft. msl. The daily average discharge at Comal Springs on September 6, 2016, was 386 cfs, 120 cfs *above* the September average of 266 cfs while the daily average discharge at San Marcos Springs on September 6, 2016 was 274 cfs, 112 cfs *above* the September average of 162 cfs.

Summary of Current Regional Aquifer Conditions

Above average rainfall returned in August which continued to sustain the entire Edwards Aquifer system. Thus, the Edwards Aquifer Region remained above Critical Period Management (CPM) thresholds. The U.S. Department of Agriculture - U.S. Drought Monitor indicated that the seasonal summer dry period led to the return of abnormal to moderate drought in some areas. As a result, about 15 - 25% of Texas returned to some form of abnormally dry to moderate drought conditions. However, over the last 30-days or so, wider scattered precipitation events/conditions led to drought improvements in south-central Texas.

The Climate Prediction Center (CPC) reports that, “ENSO-neutral conditions continue to be present.” However, with near or below average eastern Pacific sea-surface temperatures, a “La Niña is slightly favored to develop during August - October 2016, with about a 55-60% chance of La Niña during the fall and winter 2016-17.” The US Seasonal Drought Outlook shows drought removal likely in any Texas area previously experiencing seasonal summer short-term drought. In addition, the National Weather Service - Climate Prediction Center’s Long Range Outlook forecasts above normal temperatures and equal chances of above, below, or normal precipitation for south central Texas into fall 2016.