2017 WATER QUALITY SUMMARY

EDWARDS AQUIFER
AUTHORITY

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The purpose of EAA's water quality program is to monitor the quality of the water in the aquifer by sampling streams, wells, and springs across the region for a variety of parameters. Stream sample locations are upstream of the recharge zone and monitor water quality entering the aquifer. Wells located throughout the recharge and artesian zones are sampled to monitor water quality within the aquifer. Spring samples monitor the quality of water flowing out of the aquifer. EAA's sampling program provides a representative "snapshot" of water quality conditions relative to the location, time, and date the sample was collected.

The Edwards Aquifer is a karst groundwater system formed by the dissolution of limestone rock. Dissolution occurs when slightly acidic rainwater or groundwater dissolves thea limestone to create caves, sinkholes, and other features. Dissolution processes significantly enhance the permeability of the Edwards Aquifer. The aquifer is characterized by rapid recharge and fast groundwater velocities in the recharge zone, highly productive wells in the artesian zone, and large springs, e.g., Comal and San Marcos springs.

Water quality in the recharge zone can change quickly and be highly variable in time and location because of stream infiltration, rainfall, and rapid groundwater velocities. In contrast, water quality in the deep artesian zone is generally more stable because of slower groundwater velocities and larger volumes of water for dilution.

Sampling in 2017

EAA staff collected water quality samples from 8 streams, 70 wells (27 Edwards Aquifer wells and 43 Trinity Aquifer wells; some wells were sampled multiple times), and six spring groups (see Map 1 for locations). All the water samples were grab samples, which are discrete samples that represent the water composition at that specific time and place. Historical water quality data collected from streams, wells, and springs can be viewed and downloaded from EAA's web site at www.edwardsaquifer.org.

The EAA sampled both Edwards and Trinity aquifer wells in 2017. There is significant interconnectivity between the aquifers based on evidence from multiple sources. These sources include upland recharge variability studies, streamflow gain and loss studies, tracer tests, analyses of multi-port monitoring wells, geochemistry data, biologic habitat analysis, geophysics data, and inferences from groundwater modeling. While the evidence clearly illustrates connectivity, there remains significant uncertainty regarding the volume of water that may move from the Trinity Aquifer to the Edwards Aquifer. The EAA has initiated the Edwards–Trinity Interformational Flow Investigation, which is a multi-year project designed to address this uncertainty. For more information about the Edwards-Trinity Interformational Flow Investigation, please visit https://www.edwardsaquifer.org/science-and-maps/research-and-scientific-reports/interformational-flow-study.

Overall, the Edwards Aquifer produces high quality water suitable for almost any purpose. Although most samples in 2017 contained no detectable contaminants, organic compounds of concern that were detected typically had concentrations less than their maximum contaminant levels (MCLs) established by the Texas Commission on Environmental Quality (TCEQ).

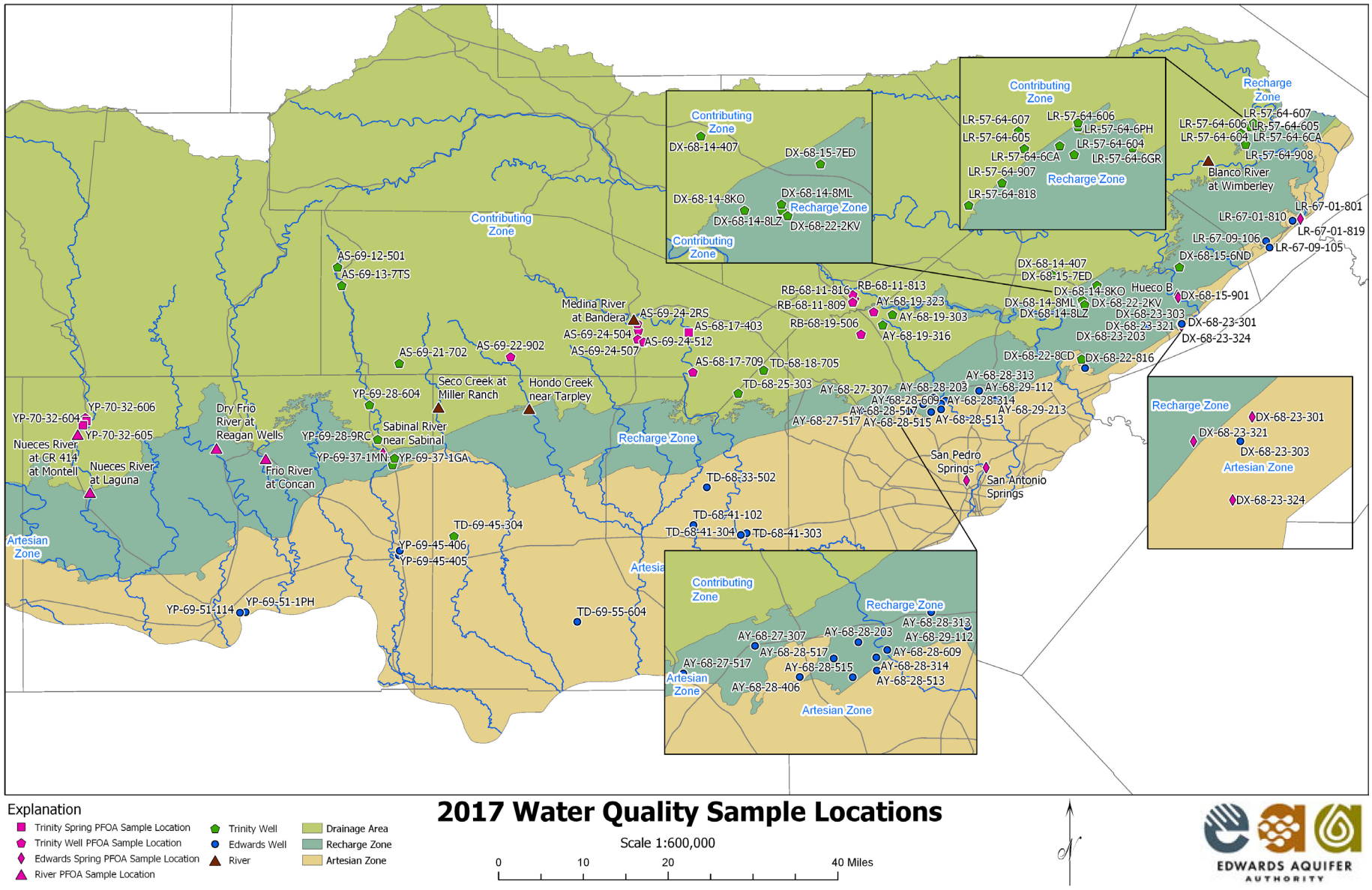
SAMPLE-COLLECTION SUMMARY, CALENDAR YEAR 2017

Parameter Group	Number of Sample Locations	Number of Samples	Detections above MCL
Bacteria	18 Edwards wells	18	0
	10 Trinity wells	10	0
	5 spring groups	55	0*
	8 stream sites	15	4*
Metals	27 Edwards wells	28	2
	43 Trinity wells	57	11
	6 spring groups	80	0
	8 stream sites	17	0
Nitrate-Nitrite as Nitrogen	27 Edwards wells	28	0
	43 Trinity wells	57	0
	6 spring groups	80	0
	8 stream sites	17	0
Volatile Organic Compounds (VOCs)	25 Edwards wells	25	0
	5 Trinity wells	5	0
	5 spring groups	55	0
	8 stream sites	0	0
Semivolatile Organic Compounds (SVOCs)	25 Edwards wells	25	0
	5 Trinity wells	5	0
	5 spring groups	55	2
	8 stream sites	16	0
Pesticide and/or Herbicide Compounds	25 Edwards wells	25	0
	5 Trinity wells	5	0
	5 spring groups	55	0
	8 stream sites	16	0
Polychlorinated Bi-Phenyls (PCBs)	10 Edwards wells	10	0
	0 Trinity wells	0	0
	5 spring groups	55	0
	8 stream sites	16	0
Polyfluorinated Alkyl Substances (PFAS)	0 Edwards wells	0	No MCLs are established for this parameter group
	11 Trinity wells	11	
	6 spring groups	35	
	4 stream sites	7	

MCL= Maximum Contaminant Level. For water quality samples, analytical results are compared with the primary standards based on concentrations published in Title 30 of the Texas Administrative Code, Chapter 290, Subchapter F http://www.sos.state.tx.us/tac/index.shtml.

*Spring and stream bacteria samples are compared with contact recreation standards as published in Texas Surface Water Quality Standards (Title 30, Chapter 307 of the Texas Administrative Code).

For compounds that do not have an established MCL, the protective concentration level is based on the Texas Risk Reduction Program, Tier 1, residential value, as referenced in Title 30, Texas Administrative Code, Chapter 350 https://www.tceq.texas.gov/remediation/trrp/trrppcls.html.



Map 1. The map shows the locations for water quality samples collected by EAA staff in 2017. The samples represent 8 streams, 70 wells, and 6 spring groups. Samples were obtained from the Contributing, Recharge, and Artesian Zones of the Edwards Aquifer. Surface water, well, and spring sample locations where PFAS compounds were detected are indicated by pink symbols.

Wells

In Edwards Aquifer wells, the organic compounds detected with the highest frequency were VOCs, such as chloroform. Chloroform is a common byproduct associated with chlorination of water, and it probably originated in public water supplies. Chloroform may have entered the aquifer via seepage from septic tanks or lawn watering. No SVOCs or pesticides were detected in Edwards Aquifer wells. However, the herbicide compound dalapon was detected once in an Edwards well. Dalapon is a common herbicide that is applied to control grasses and may be used in agriculture and in right-of way areas, e.g., roadsides. In the Trinity Aquifer wells sampled, no VOCs, SVOCs, herbicides, or pesticides were detected.

Some dissolved metals, such as iron, manganese, strontium, and lithium, are naturally occurring in Edwards and Trinity aquifer waters. In some cases, these metals can occur at concentrations above their individual MCLs. Iron and manganese were detected above their MCLs in one Edwards well. Iron (five wells), lithium (one well), and strontium (three wells) were also detected above MCLs in some Trinity Aquifer samples. These detections are classified as naturally occurring. None of the detections of metals or other inorganic constituents represented an unexpected event or situation of concern for the specific wells involved.

Streams

Stream samples were generally collected at USGS gauging stations located upstream of the recharge zone. The sampled streams contribute significant recharge to the Edwards Aquifer as they flow across the Recharge Zone. In 2017, no PCBs, SVOCs, herbicide, or pesticide compounds were detected in stream water analyses.

Springs

Springs samples represent water composited by the vast underground drainage network that makes up the aquifer. No VOCs, pesticides, herbicides, or PCBs were detected in the spring samples. No metals were detected above their respective MCLs. The SVOC compound Bis (2-ethylhexyl) phthalate (DEHP) was detected above its MCL once at Hueco Springs A and once at San Marcos Spring – Hotel. DEHP is a plasticizer and is used in many products ranging from polyvinyl chloride (PVC) piping to food containers. DEHP is occasionally detected at low levels in the springs. DEHP was not detected in subsequent samples from Hueco Springs or San Marcos Springs in 2017.

Several continuous water quality monitoring stations were established in 2013 for Comal and San Marcos Springs. Monitoring is performed using data logging sondes capable of collecting data at 15-minute intervals. The parameters measured are temperature, dissolved oxygen, pH, turbidity, and specific conductance. These data help EAA evaluate short-term and long-term water quality variations the spring systems as well as changes in water quality related to storm water runoff. Figure 1 shows the range of measured specific conductance values at selected Comal and San Marcos spring monitor locations during 2017. The median values for the two systems are different and reflect the slight differences in chemistry between the two spring systems. The Comal Spring data varies little and represents the relatively constant chemistry of spring water. The San Marcos data varies more and reflects the added influence of storm water runoff for that monitored location.

PFAS Sampling

Samples for analysis of polyfluorinated alkyl substances (PFAS) were collected at 11 Trinity aquifer wells, six spring groups, and four streams in 2017. PFAS comprise a range of compounds used in Teflon coatings, fabric protection, and fire-fighting foams. Because they are chemically inert and environmentally persistent, PFAS represent a potential means to track flow paths in the aquifer system. PFAS sampling performed in 2017 provided additional insight into the presence of these compounds in surface water, groundwater, and spring water. All six spring groups, 11 Trinity aquifer wells, and four streams that were tested in 2017 had some detectable PFAS. At least 15 different PFAS compounds were detected, although not all compounds were present in each sample. All PFAS concentrations were at extremely low levels and were indicative of values expected for background. Currently, TCEQ has not proposed regulatory concentration limits for PFAS.

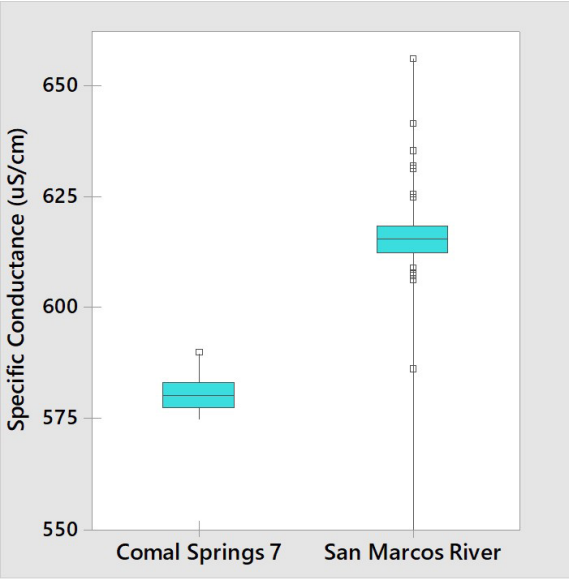


Figure 1. Range of specific conductance values at Comal and San Marcos springs during 2017. The boxes bound the 10th to 90th percentiles of values, while the whiskers show the entire range of data. The wide range for San Marcos is due to rainfall events that produce surface water impacts to measurements taken at this location.

Summary

Although the Edwards Aquifer produces high quality water for drinking water and agriculture, there is a potential for contaminants to enter the aquifer through the recharge zone; thus, the aquifer is especially vulnerable in this region. The EAA will continue to monitor water quality of the drainage, recharge, and artesian zones in its mission to manage, enhance, and protect the Edwards Aquifer.

BACTERIA SAMPLES AND PRIVATE WELL OWNERS

In 2017, the EAA collected bacteria samples from 28 wells (18 Edwards aquifer wells and ten Trinity aquifer wells). All sample test results were negative for bacteria, *Escherichia coli (E. coli)*. The EAA collects bacteria samples from wells before any chlorination equipment to assess the presence or absence of bacteria in raw water samples from the aquifer. These sample results are not directly comparable to bacterial samples collected by most public water supply systems which are generally collected after chlorination equipment. *E. coli* bacteria analyses are used to indicate the possible presence of fecal matter in groundwater and surface water.