



North Bosque River Discussion



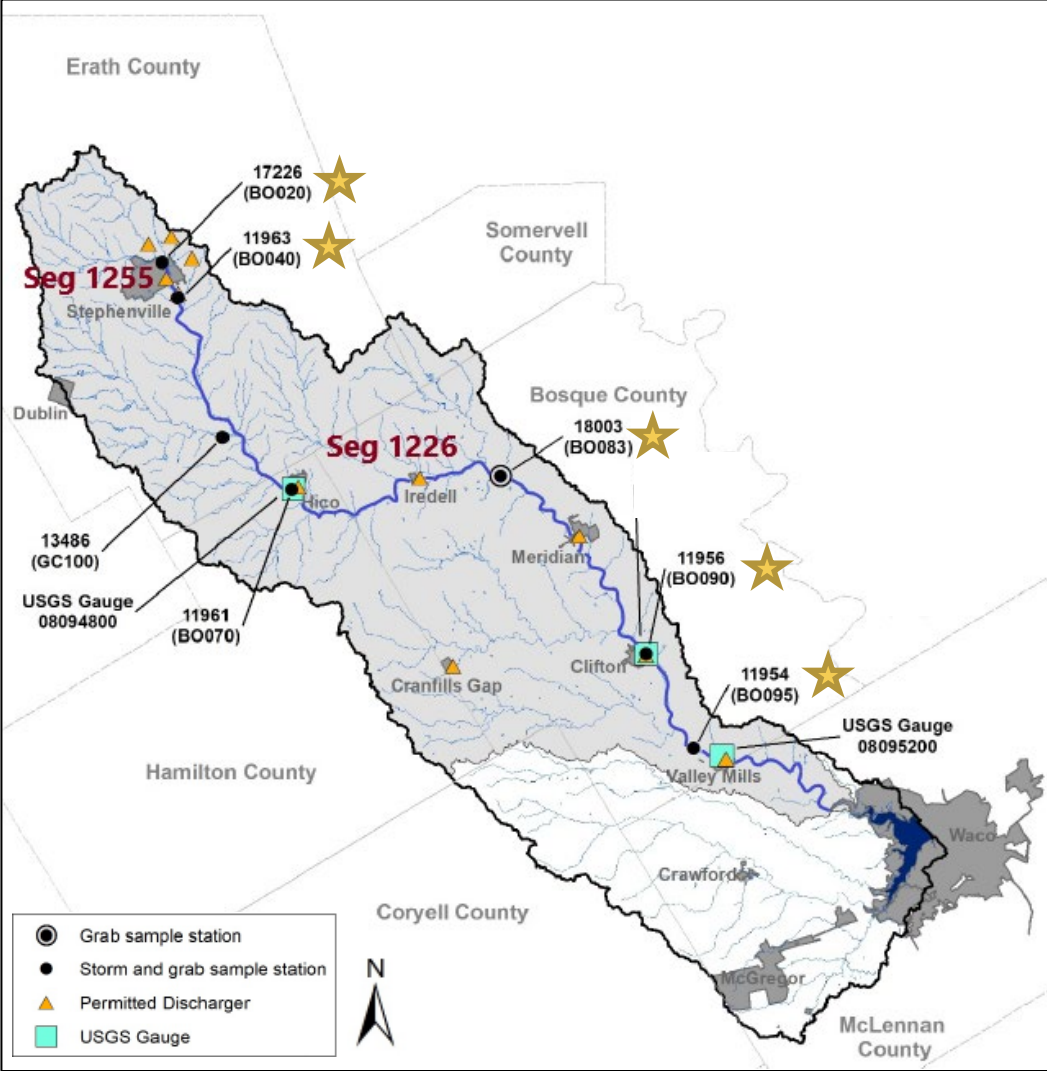
Presented by Anchor QEA on behalf of City of Waco

1/21/2021

Objective

- To share the City of Waco's perspectives on the TIAER data and how it informs our understanding of the TMDL and water quality impairment

Refresher: Segments and Sampling Stations



TMDL Evaluation

Data Highlights- SRP

All plots and tables obtained or adapted from
TIAER reports

TMDL Probability Curves for SRP

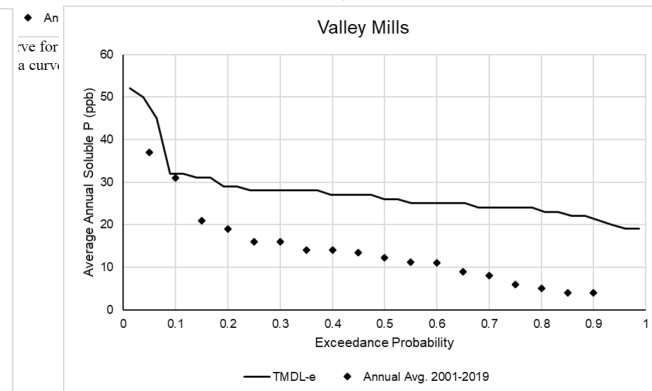
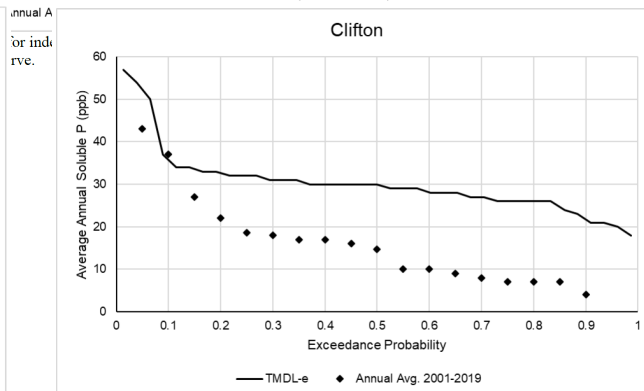
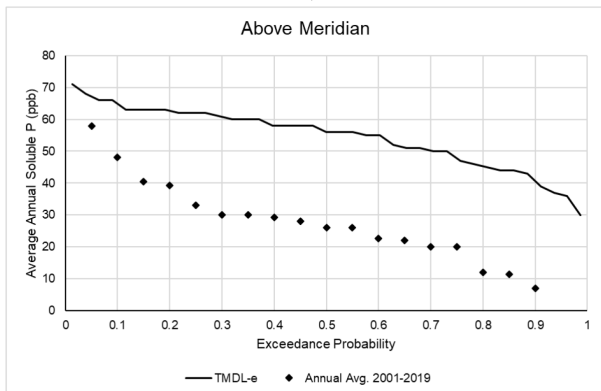
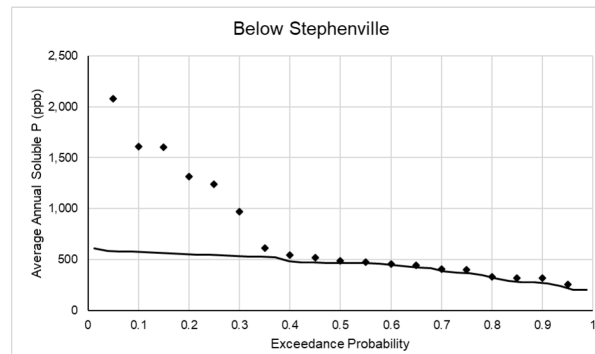
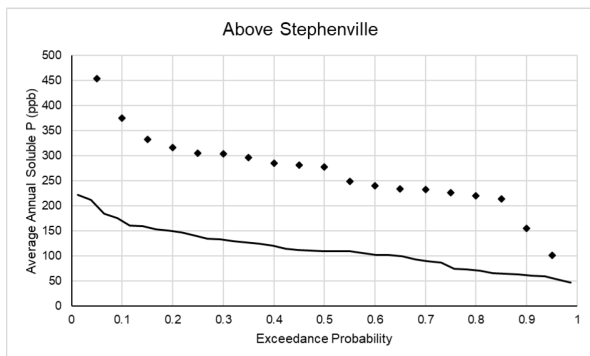


Figure 15 TMDL goal probability curve for index site above Meridian (18003 [BO083]) compared to monitored data curve.

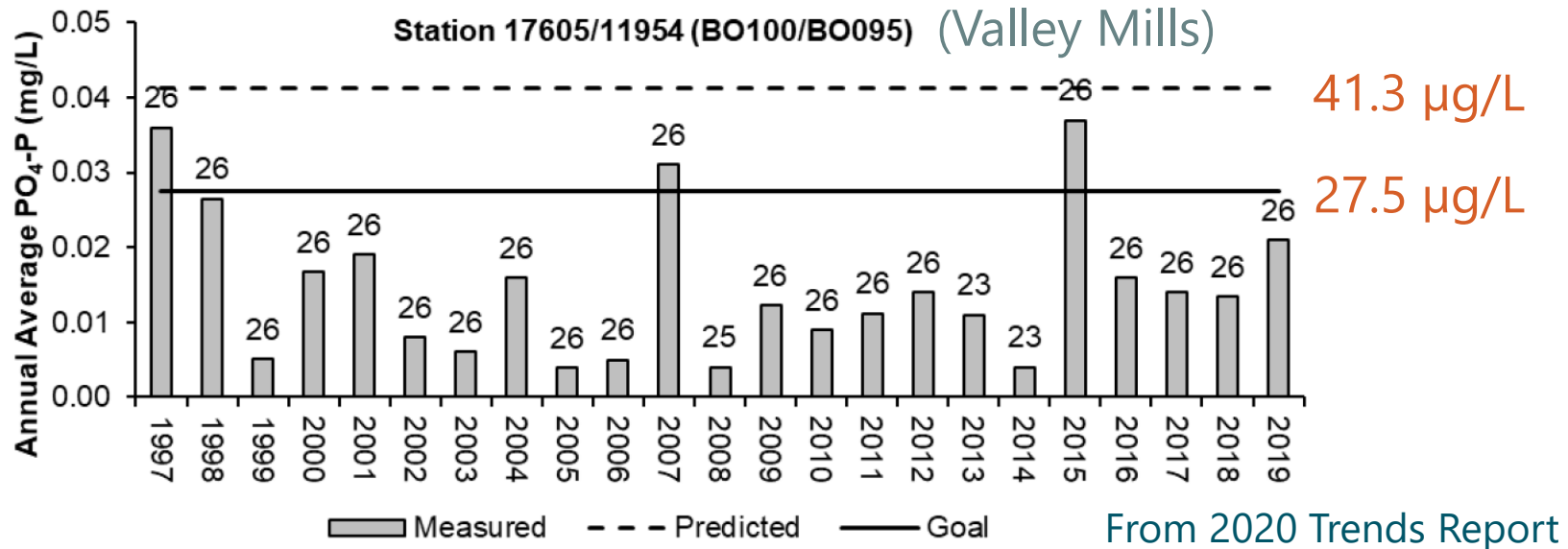
Figure 16 TMDL goal probability curve for index site at Clifton (11956 [BO090]) compared to monitored data curve.

Figure 17 TMDL goal probability curve for index site at Valley Mills (11954 [BO095]) compared to monitored data curve.

- 3 of 5 stations meet TMDL goals
 - Dots below line for at least 80% of data (Implementation Plan)

From 2020 Trends Report

Annual Average SRP



- Valley Mills- Data appear to meet TMDL goal before TMDL implementation in 2001
 - We do not see a trend in these data
- Above Meridian and Clifton also appeared to meet goals before 2001 and had no visual trend

Temporal Trends in SRP

- Valley Mills- Magnitude of trend since 1996 has diminished over time, likely because little/no decrease since 2001

Table 11 Trend results for routine grab data for station 11954 (BO095).

Data transformed using a natural log transformation and adjusted for flow prior to trend analysis. Significant slopes indicated at a p-value of 0.05.

Parameter	Period Evaluated	Kendall Test Statistic ^a	p-value ^a	End Year 2019	End Year 2018 ^b	End Year 2017 ^b	End Year 2016 ^b	End Year 2015 ^b	End Year 2014 ^b	End Year 2013 ^b	End Year 2012 ^b	End Year 2011 ^b	End Year 2010 ^b	End Year 2009 ^b	End Year 2008 ^b
PO ₄ -P	1996-2019	-0.130	0.0011	-1.3	-1.2	-1.4	-1.6	-1.1	-1.8	-2.4	-3.4	-4.4	-5.2	-5.3	-5.9

a. Results for year 2019.

b. Summary of significant trend slopes (McFarland and Millican 2009, 2010, 2011, 2012; McFarland and Adams 2013, 2014a, 2015, 2016, 2017, 2018; and Millican, Adams, and McFarland 2019).

From 2020 Trends Report

- At other sites –
 - Clifton, little/no decrease since 1990s
 - Below Stephenville, little/no decrease since mid-2000s
 - Above Stephenville and Above Meridian, no significant trends

Water Quality Impairment

Data Highlights- Chlorophyll-a

All plots and tables obtained or adapted from
TCEQ and TIAER reports

2020 Integrated Report Summary

Segment	AU	Index Station	1998 IR	2020 IR	
			Excessive Algal Growth Impairment	Excessive Algal Growth Impairment	Nutrient Screening Level Concern
1255	AU-02	17226	NS	NS	Chl-a
	AU-01	11963		NS	Chl-a, Nitrate
1226	AU-04	None	NS	NS	Chl-a
	AU-03	18003		NS	Chl-a
	AU-02	11956		NS	Chl-a
	AU-01	11954	--	--	Chl-a

- All AUs originally listed as impaired for excessive algal growth have been carried forward
- Chlorophyll-a concerns remain on all AUs

Temporal Trends in Chlorophyll-a

- Valley Mills – No trend between 1996 and any year

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Data transformed using a natural log transformation and adjusted for flow prior to trend analysis. Significant slopes indicated at a p-value of 0.05.

Parameter	Period Evaluated	Kendall Test Statistic ^a	p-value ^a	End Year 2019	End Year 2018 ^b	End Year 2017 ^b	End Year 2016 ^b	End Year 2015 ^b	End Year 2014 ^b	End Year 2013 ^b	End Year 2012 ^b	End Year 2011 ^b	End Year 2010 ^b	End Year 2009 ^b	End Year 2008 ^b
CHLA	1996-2019	-0.001	0.9740												

a. Results for year 2019.

b. Summary of significant trend slopes (McFarland and Millican 2009, 2010, 2011, 2012; McFarland and Adams 2013, 2014a, 2015, 2016, 2017, 2018; and Millican, Adams, and McFarland 2019).

From 2020 Trends Report

- At other sites
 - No significant trends at Above Stephenville and Clifton
 - Decreasing trend at Below Stephenville site
 - Increasing trend at Above Meridian site

Discussion

TMDL Attainment Discussion

- Above Stephenville
 - SRP has not improved
 - TMDL goals not met
- Below Stephenville
 - Substantial improvements in SRP after the TMDL
 - TMDL goals not met, but approaching
- Three downstream sites
 - SRP has improved little, if at all, since the TMDL
 - TMDL goals met
 - TMDL modeling overpredicted existing concentrations
 - These sites were already meeting TMDL goals prior to implementation

Water Quality Impairment Discussion

- Narrative criteria
 - “Narrative criteria are evaluated with screening levels... as well as other information... All available lines of evidence must be considered when making listing decisions, including professional judgment.”
- Chlorophyll-a
 - Has not decreased at 4 of the 5 sites
 - Remains above the screening level at all 5 sites

Recommendations

- Maintain current NS listings
- Adjust monitoring program
 - Every other month
- Redirect Resources
 - Study to quantify linkage between chlorophyll-a and SRP
 - Identify SRP sources
 - Enhanced stormwater monitoring
- Future Goal: Improve understanding of water quality trends and cause of chlorophyll-a CS classification

Questions/Discussion

