Mission and Aransas Rivers Watershed: A Community Project to Protect Recreational Uses

Two Total Maximum Daily Loads for Indicator Bacteria in the Tidal Segments of the Mission and Aransas Rivers[1]

Adopted May 25, 2016.

Approved by EPA August 9, 2016.

Two TMDLs for Indicator Bacteria in Aransas River Above Tidal and Poesta Creek Added by Addendum I, October 2017[2]

Via the October 2017 Update to the Texas Water Quality Management Plan.

Approved by EPA February 8, 2018.

One TMDL for Indicator Bacteria in Poesta Creek Added by this Addendum II, January 2024

Via the January 2024 Update to the Texas Water Quality Management Plan (SFR-121/2024-02).

Approved by EPA April 17, 2024 (scroll to view or print this addendum).

[1] https://www.tceq.texas.gov/downloads/water-quality/tmdl/mission-aransas-rivers-recreational-76/76a-mission-aransas-rivers-tmdl-approved.pdf
[2] https://www.tceq.texas.gov/downloads/water-quality/tmdl/mission-aransas-rivers-recreational-76/76-mission-aransas-addendum-oct-2017.pdf

Appendix V. Addendum Two to Two Total Maximum Daily Loads for Indicator Bacteria in the Tidal Segments of the Mission and Aransas Rivers

Adding one TMDL for AU 2004B_01

One TMDL for Indicator Bacteria in Poesta Creek

Introduction

TCEQ adopted *Two Total Maximum Daily Loads for Indicator Bacteria in the Tidal Segments of the Mission and Aransas Rivers* (TCEQ, 2016) on May 25, 2016. The United States (U.S.) Environmental Protection Agency (EPA) approved the TMDLs on Aug. 9, 2016. An addendum to the original TMDLs was submitted to EPA through the Oct. 2017 WQMP update (TCEQ, 2017). That addendum added two additional assessment units (AUs). This document is the second addendum to the original TMDL report.

This second addendum includes information specific to one additional AU for indicator bacteria for Poesta Creek (AU 2004B_01). This AU is located within the watershed of the approved original TMDLs for the Mission and Aransas Rivers. The concentration of indicator bacteria in this additional AU exceeds the criterion used to evaluate support of the primary contact recreation 1 use.

This addendum details the development of the added TMDL allocation for this additional AU, which was not specifically addressed in the original TMDL report. For background or other explanatory information, please refer to the *Technical Support Document for One Total Maximum Daily Load for Indicator Bacteria in Poesta Creek*[3] (Jain and Schramm, 2023). Refer to the original, approved TMDL document for details about the overall project watershed as well as methods and assumptions used in developing the original TMDLs.

[3] www.tceq.texas.gov/downloads/water-quality/tmdl/caney-creek-linnville-bayou-recreational-115/as-486-115b-caney_creek_addendum-tsd.pdf

Problem Definition

TCEQ first identified the bacteria impairment for Poesta Creek AU 2004B_02 in the *2022 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)* (Texas Integrated Report; TCEQ, 2022a), the latest EPA-approved edition. The water body includes only two AUs. The upstream AU 2004B_02 was addressed in the first addendum. Figure V-1 shows the watershed added in this addendum in relation to the entire watershed of the original TMDLs, and also includes the watershed from the first addendum.

The Texas Surface Water Quality Standards (TCEQ, 2022b) identifies uses for surface waters and numeric and narrative criteria to evaluate attainment of those uses. The basis for the water quality target for the TMDL developed in this addendum is the numeric criterion for indicator bacteria from the 2022 Texas Surface Water Quality Standards. *Escherichia coli* (*E. coli)* are the indicator bacteria for assessing primary contact recreation 1 use in freshwater.

Figure V-1. Map showing the previously approved TMDL watersheds and the Poesta Creek 2004B_01 watershed added by this addendum

Table V-1 summarizes the ambient water quality data for the TCEQ surface water quality monitoring (SWQM) station in the water body, as reported in the 2022 Texas Integrated Report. The data from the assessment indicate nonsupport of the primary contact recreation 1 use for the AU, because the geometric mean concentration for *E. coli* exceeds the freshwater geometric mean criterion of 126 cfu/100 mL of water. Figure V-2 shows the location of the TCEQ SWQM station that was used in evaluating water quality in the 2022 Texas Integrated Report for the water body added by this addendum.

Table V-1. 2022 Texas Integrated Report summary

AU	TCEQ SWQM Station	Parameter	Number of Samples	Date Range	*E. coli* Geometric Mean (cfu/100 mL)
2004B_01	12937	*E. coli*	21	12/01/13 – 11/30/20	269.79

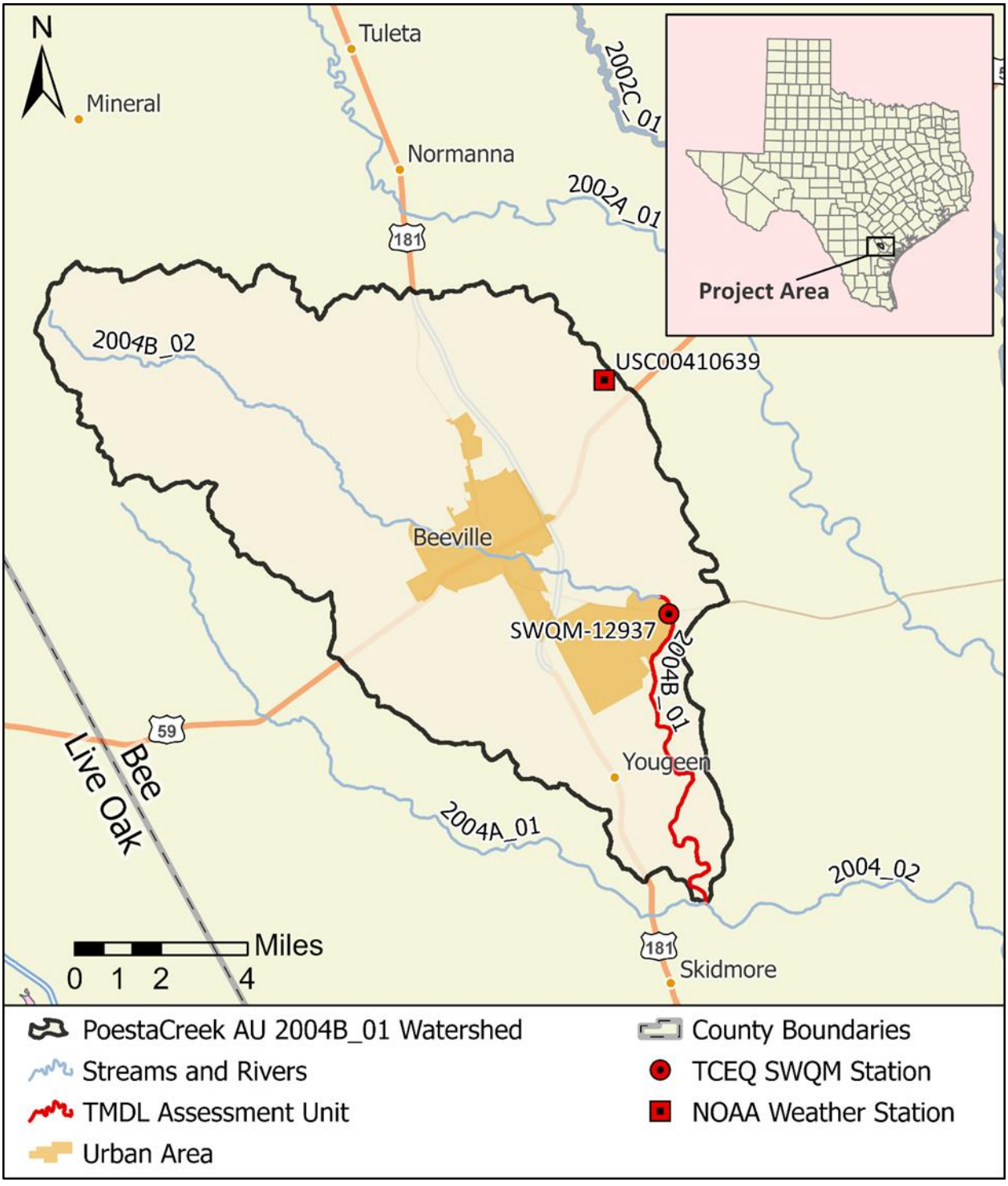

Figure V-2. Active TCEQ SWQM station

Watershed Overview

Poesta Creek runs from northwest of Beeville and flows approximately 28.73 miles southeast to Aransas River Above Tidal (AU 2004_02). It consists of a single segment (2004B) and two AUs (2004B_01 and 2004B_02). This document will consider the contact recreation use impairment of the downstream AU of Poesta Creek (2004B_01). The drainage area for AU 2004B_01, including the contributing area from upstream AU 2004B_02, is 123.06 square miles (78,765.53 acres) and is located entirely in Bee County. The 2004b_01 watershed along with the upstream catchment area of 2004B_02 will be referred to in this addendum as the TMDL watershed or the Poesta Creek watershed.

The 2022 Texas Integrated Report has the following water body and AU descriptions:

- Poesta Creek (Segment 2004B) – From the confluence with the Aransas River to the headwaters of the stream about 7.5 kilometers upstream of Farm-to-Market Road 673.
    - AU 2004B_01 – From the confluence of the Aransas River to the confluence of Talpacate Creek.
    - AU 2004B_02 – From the confluence with Talpacate Creek to the headwaters of the stream approximately 7.5 kilometers upstream of Farm-to-Market Road 673.

Climate

Regional precipitation and temperature data were obtained from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center database. The precipitation and temperature data were obtained from the Beeville 5 NE, TX weather station (USC00410639) for a 15-year period from 2008 through 2022 (NOAA, 2023). The highest average monthly precipitation is observed in September at 4.02 inches and the lowest monthly precipitation is observed in February at 1.17 inches (Figure V-3). The highest observed monthly maximum temperatures occur in August (96.52 °F) and the lowest average monthly minimum temperatures occur in January (42.59 °F). The mean annual recorded precipitation within the 15-year period between 2008-2022 was 30.28 inches.

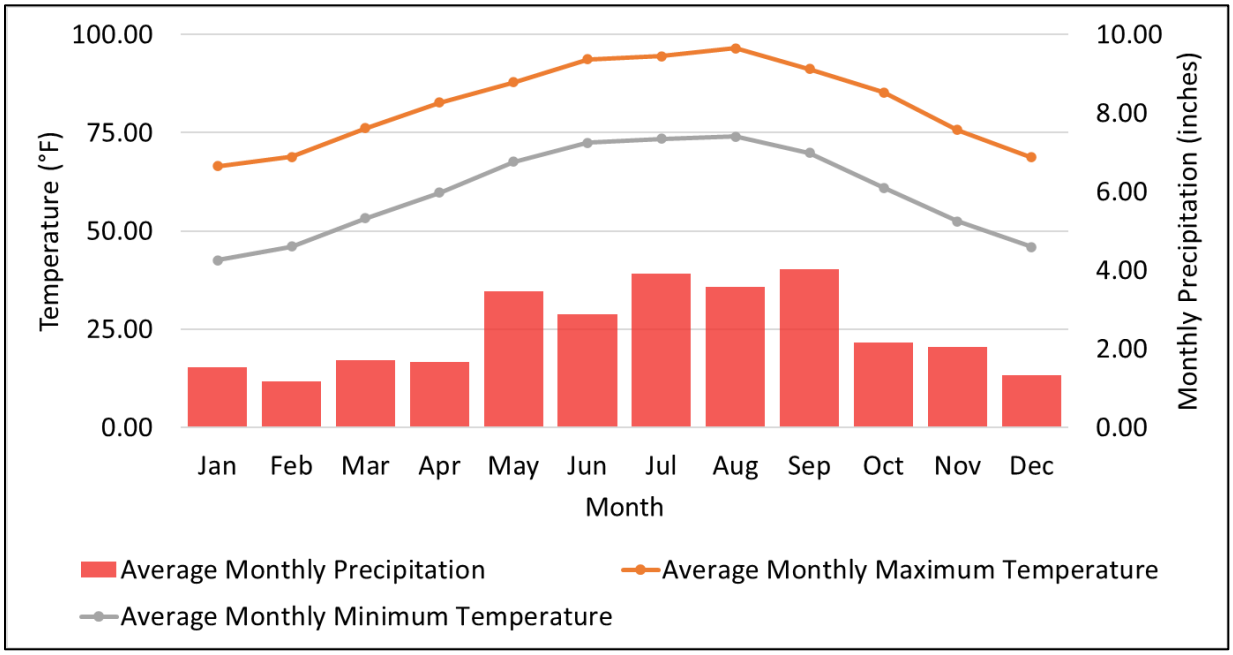

Figure V-3. Average monthly temperature and precipitation (2008-2022) at the Beeville 5 NE, TX station USC00410639 weather station

Population and Population Projections

The TMDL watershed is located within Bee County. Current predominant population densities for this watershed are mostly around the City of Beeville. Using data obtained from the U.S. Census Bureau (USCB) 2020 census blocks (2020a) and 2020 decennial population data (USCB, 2020b), the Poesta Creek watershed had an estimated population of 21,357 people in 2020.

A population projection through 2070 was developed using data from USCB to be consistent with the original TMDLs. Table V-2 provides a summary of the population projection for the added TMDL watershed.

Table V-2. 2020 – 2070 population projection

Area	2020 Estimated Population	2070 Projected Population	Projected Population Increase	Percent Change
Poesta Creek Watershed	21,357	22,705	1,348	6.31%

The following steps detail the method used to estimate the 2020 and projected 2070 populations in the Poesta Creek watershed.

1. The 2020 USCB block level population data was obtained for Bee County.

2. The 2020 watershed population was estimated by adding the total population of the blocks located entirely within the watershed.
3. For the census blocks partially located in the watershed, the block population was determined by multiplying the total block population by the proportion of the block area within the watershed. This was added to the population estimate from step 2.
4. Decadal population projections for Bee County between 2020-2070 were obtained from the Texas Water Development Board (TWDB) county population projections dataset (TWDB, 2021).
5. Projected decadal population percentage increases in Bee County were calculated for each decade between 2020-2070.
6. The county level projected population percentage increases calculated in Step 5 were added to the 2020 watershed population determined in steps 1-3 to obtain population projections for the Poesta Creek watershed.

Land Cover

Land cover data for the TMDL watershed were obtained from the U.S. Geological Survey 2019 National Land Cover Database (NLCD; USGS, 2021). The land cover for the TMDL watershed is shown in Figure V-4. A summary of the land cover data is provided in Table V-3 and indicates that the addendum TMDL watershed is predominantly composed of Shrub/Scrub (39.75%) and Pasture/Hay (31.7%).

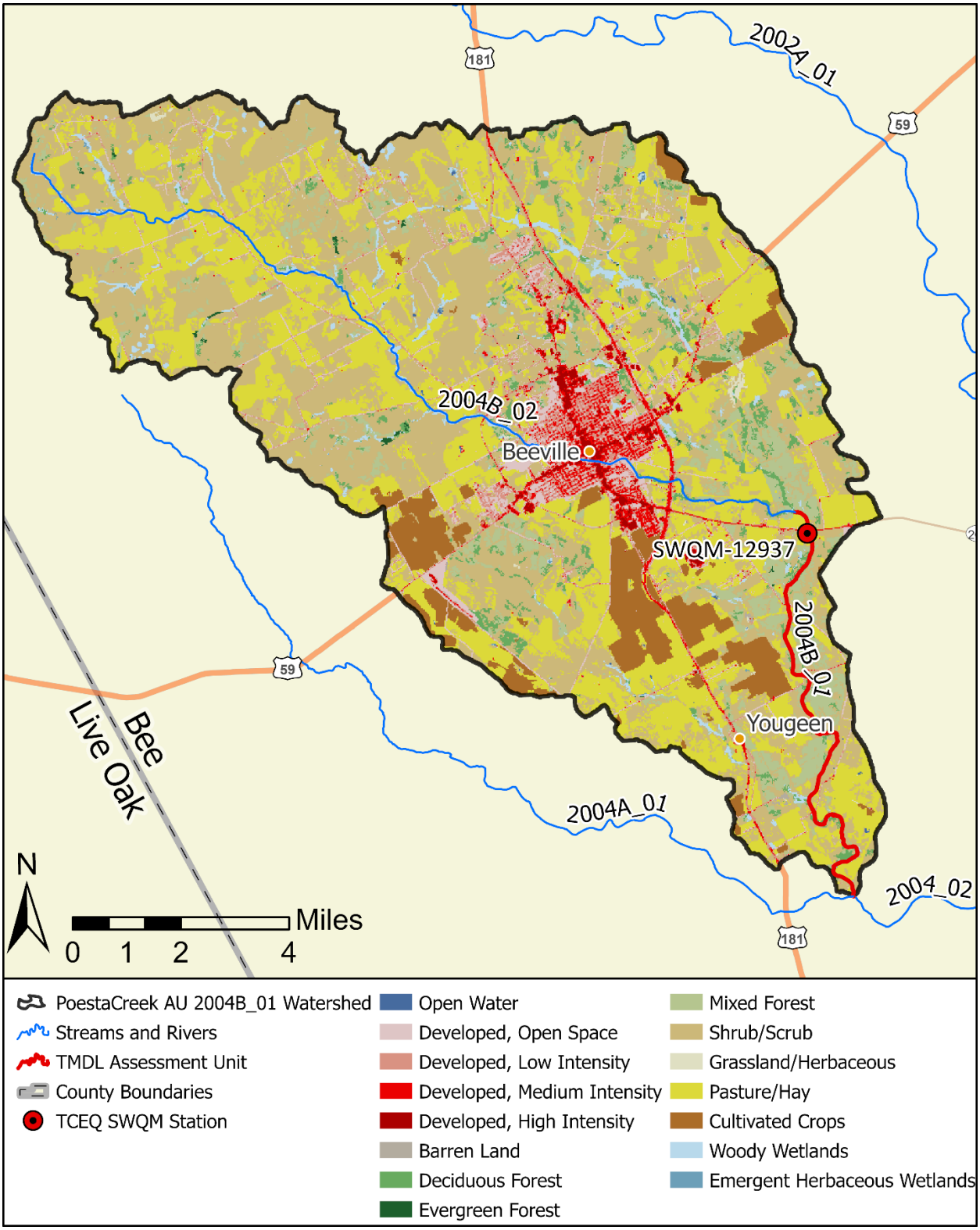

Figure V-4. Land cover map showing classifications

Table V-3. Land cover classification by area and percentage

2019 NLCD Land Cover Classification	Area (Acres)	% of Total
Open Water	43.14	0.05%
Developed, Open Space	3,369.64	4.28%
Developed, Low Intensity	2,788.46	3.54%
Developed, Medium Intensity	1,741.46	2.21%
Developed, High Intensity	567.76	0.72%
Barren Land	142.96	0.18%
Deciduous Forest	2,142.86	2.72%
Evergreen Forest	75.66	0.10%
Mixed Forest	5,165.63	6.56%
Shrub/Scrub	31,312.97	39.75%
Grassland/Herbaceous	173.18	0.22%
Pasture/Hay	24,967.90	31.70%
Cultivated Crops	4,509.02	5.72%
Woody Wetlands	1,702.57	2.16%
Emergent Herbaceous Wetlands	62.32	0.08%
Total	**78,765.53**	**100%**

Endpoint Identification

The endpoint for the TMDL is to maintain the concentration of *E. coli* below the geometric mean criterion of 126 colony forming units per 100 milliliters (cfu/100 mL), which is protective of the primary contact recreation 1 use in freshwater.

Source Analysis

Pollutants may come from several sources, both regulated and unregulated. Pollutants in regulated discharges, referred to as “point sources,” come from a single definable point, such as a pipe, and are regulated by permit under the Texas Pollutant Discharge Elimination System (TPDES) program. Wastewater treatment facilities (WWTFs) and stormwater discharges from industries, construction activities, and the separate storm sewer systems of cities are considered point sources of pollution.

Unregulated sources are typically nonpoint source in origin, meaning the pollutants originate from multiple locations and rainfall runoff washes them into surface waters. Nonpoint sources are not regulated by permit.

Except for WWTFs, which receive individual wasteload allocations (WLAs; see the Wasteload Allocation section), the regulated and unregulated sources in this section are presented to give a general account of the different sources of bacteria expected in the watershed. These are not meant to be used for allocating bacteria loads or interpreted as precise inventories and loadings.

Regulated Sources

Regulated sources are controlled by permit under the TPDES program. The regulated sources in the TMDL watershed include WWTF outfalls, sanitary sewer overflows (SSOs), and stormwater discharges from industrial and regulated construction sites.

Domestic and Industrial WWTFs

As of December 2022, there is one WWTF with a TPDES permit within the TMDL watershed (Table V-4 and Figure V-5).

Table V-4. TPDES-permitted WWTFs discharging in the TMDL watershed

AU	TPDES Number	NPDES[a] Number	Permittee	Outfall Number	Bacteria Limits (cfu/ 100 mL)	Primary Discharge Type	Daily Average Flow – Permitted Discharge (MGD)
2004B_02	WQ0010124002	TX0047007	Moore Street WWTF	1	120	Treated domestic wastewater	3.0

[a]NPDES: National Pollutant Discharge Elimination System

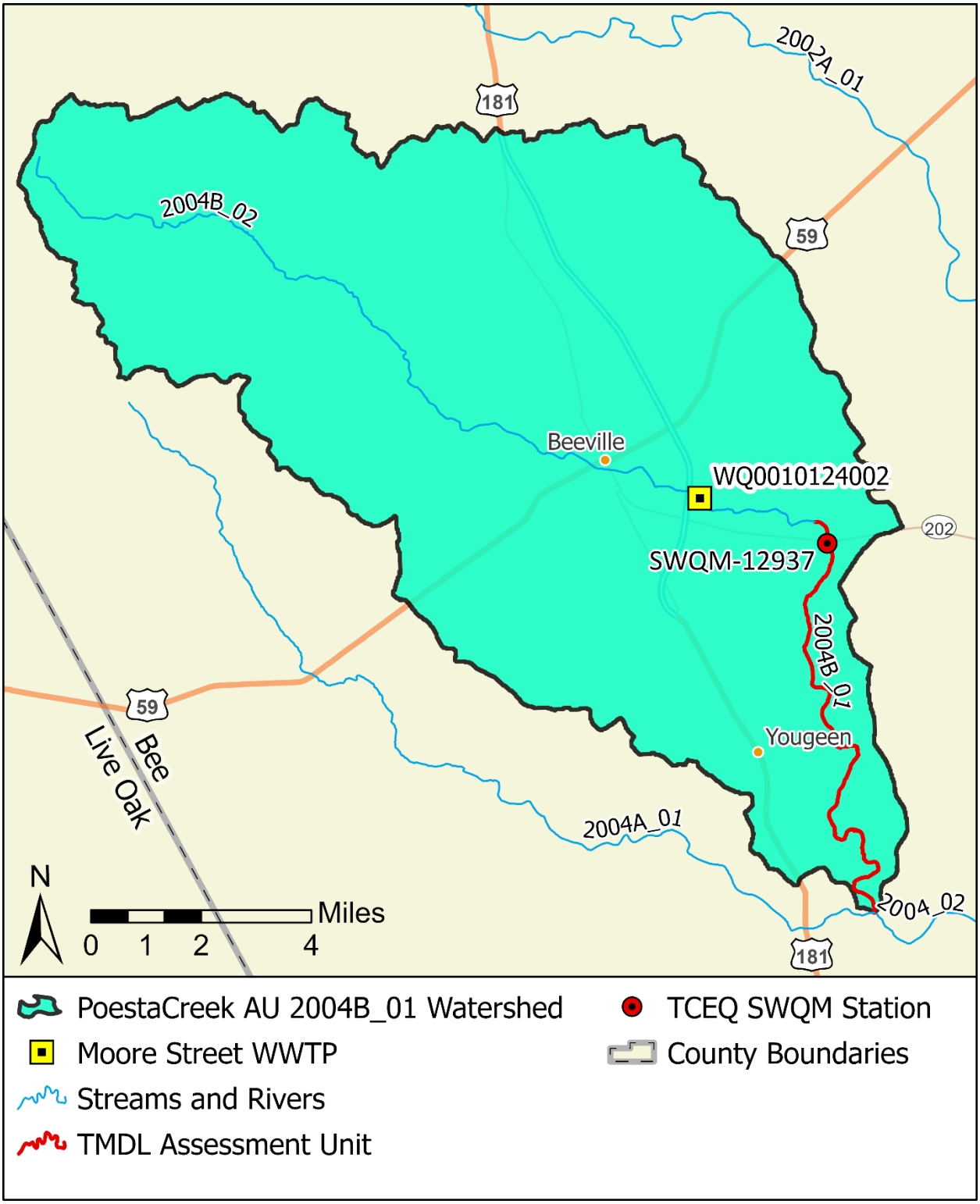

Figure V-5. WWTFs in the TMDL watershed

TCEQ/TPDES Water Quality General Permits

Certain types of activities are required to be covered by one of several TCEQ/TPDES wastewater general permits:

- TXG110000 – concrete production facilities
- TXG130000 – aquaculture production
- TXG340000 – petroleum bulk stations and terminals
- TXG640000 – conventional water treatment plants
- TXG670000 – hydrostatic test water discharges
- TXG830000 – water contaminated by petroleum fuel or petroleum substances
- TXG870000 – pesticides (application only)
- TXG920000 – concentrated animal feeding operations
- WQG100000 – wastewater evaporation
- WQG200000 – livestock manure compost operations (irrigation only)

A review of active general permit coverage (TCEQ, 2022c) in the TMDL watershed as of December 2022, found one permittee covered by a general permit. The regulated areas do not have bacteria reporting or limits in their permits. They were assumed to contain inconsequential amounts of bacteria; therefore, it was unnecessary to allocate bacteria loads based on these activities. No other active wastewater general permit authorizations were found.

Sanitary Sewer Overflows

A summary of SSO incidents that occurred during a seven-year period from 2016 through 2022 in the TMDL watershed was obtained from TCEQ Central Office in Austin. The summary data indicated that 22 SSO incidents had been reported within the TMDL watershed. All SSO incidents were due to a temporary blockage of the collection system. The SSOs had a total discharge of 249,480 gallons with a minimum of 30 gallons and a maximum of 93,750 gallons.

TPDES-Regulated Stormwater

When evaluating stormwater for a TMDL allocation, a distinction must be made between stormwater originating from an area under a TPDES-regulated discharge permit and stormwater originating from areas not under a TPDES-regulated discharge permit. Stormwater discharges fall into two categories:

1. Stormwater subject to regulation, which is any stormwater originating from TPDES-regulated municipal separate storm sewer system (MS4) entities, stormwater discharges associated with regulated industrial facilities, and construction activities.
2. Stormwater runoff not subject to regulation.

Discharges of stormwater from a Phase II MS4 area, regulated industrial facility, construction area, or other facility involved in certain activities must be covered under the following TCEQ/TPDES general permits:

- TXR040000 – Phase II MS4 General Permit for MS4s located in urbanized areas
- TXR050000 – Multi-sector general permit (MSGP) for industrial facilities
- TXR150000 – Construction general permit (CGP) for construction activities disturbing more than one acre or are part of a common plan of development disturbing more than one acre

A review of active stormwater general permit authorizations (TCEQ, 2022d) in the TMDL watershed as of December 2022 found a total of 26 active MSGP authorizations and CGP authorizations within the watershed. There are currently no Phase I MS4 permits and no Phase II MS4 authorizations within the TMDL watershed.

Illicit Discharges

Pollutant loads can enter water bodies from MS4 outfalls that carry authorized sources as well as illicit discharges under both dry- and wet-weather conditions. The term "illicit discharge" is defined in TPDES General Permit TXR040000 for Phase II MS4s as "Any discharge to a municipal separate storm sewer system that is not entirely composed of stormwater, except discharges pursuant to this general permit or a separate authorization and discharges resulting from emergency firefighting activities." Illicit discharges can be categorized as either direct or indirect contributions.

Unregulated Sources

Unregulated sources of bacteria are nonpoint and can originate from wildlife and feral hogs, various agricultural activities, agricultural animals, land application fields, urban runoff not covered by a permit, failing on-site sewage facilities (OSSFs), and domestic pets.

Unregulated Agricultural Activities and Domesticated Animals

A number of agricultural activities that do not require permits can be potential sources of fecal bacteria loading. Livestock are present throughout the more rural portions of the project watershed.

Table V-5 provides estimated numbers of selected livestock in the watershed based on the 2017 Census of Agriculture conducted by the U.S. Department of Agriculture (USDA; USDA, 2019). The county-level estimated livestock populations were reviewed by Texas State Soil and Water Conservation Board staff and were distributed based on geographic information system (GIS) calculations of pastureland in the watershed,

based on the 2019 NLCD (USGS, 2021). These livestock numbers, however, were not used to develop an allocation of allowable bacteria loading to livestock.

Table V-5. Estimated livestock populations

Area	Cattle and Calves	Hogs and Pigs	Poultry	Goats and Sheep	Horses
Poesta Creek Watershed	4,281	50	662	217	135

Fecal bacteria from dogs and cats is transported to water bodies by runoff in both urban and rural areas and can be a potential source of bacteria loading. Table V-6 summarizes the estimated number of dogs and cats within the TMDL watershed. Pet population estimates were calculated as the estimated number of dogs (0.614) and cats (0.457) per household (AVMA, 2018). The number of households in the TMDL watershed was estimated using 2020 Census data (USCB, 2020b). The actual contribution and significance of bacteria loads from pets reaching the TMDL watershed is unknown.

Table V-6. Estimated households and pet population

Estimated Households	Estimated Dog Population	Estimated Cat Population
8,003	4,914	3,657

Wildlife and Unmanaged Animals

Fecal bacteria are common inhabitants of the intestines of all warm-blooded animals, including wildlife such as mammals and birds. In developing bacteria TMDLs, it is important to identify by watershed the potential for bacteria contributions from wildlife. Wildlife are naturally attracted to riparian corridors of water bodies. With direct access to the stream channel, the direct deposition of wildlife waste can be a concentrated source of bacteria loading to a water body. Fecal bacteria from wildlife are also deposited onto land surfaces, where they may be washed into nearby water bodies by rainfall runoff.

For feral hogs, a study by Timmons et. al (2012) estimates one hog per 33.3 acres as the average density for feral hogs in the TMDL watershed. Habitat deemed suitable for hogs includes the following classifications from the 2019 NLCD land cover: Pasture/Hay, Cultivated Crops, Shrub/Scrub, Grassland/Herbaceous, Deciduous Forest, Evergreen Forest, Mixed Forest, Woody Wetlands, and Emergent Herbaceous Wetlands. The estimated feral hog density was applied to the area suitable for feral hog habitat which

estimated that there are about 2,105 feral hogs in the Poesta Creek watershed (Table V-7).

For deer, the Texas Parks and Wildlife Department (TPWD) has published data showing deer population-density estimates by Deer Management Unit (DMU) and Ecoregion in the state. TPWD biologists provided estimates for DMUs in Bee County, which included DMUs 8E, 9, 10, and 11 (TPWD, 2021). Based on estimates from 2005 through 2019, an average of one white tail deer per 58.08 acres of habitat was calculated across the watershed. The same 2019 NLCD land cover types used previously for feral hogs are the same types used for deer. Applying this value to the suitable habitat area of the TMDL watershed returns an estimated 1,207 deer within the watershed (Table V-7). The *E. coli* contribution from feral hogs and wildlife in the Poesta Creek watershed could not be determined based on existing information.

Table V-7. Estimated deer and feral hog populations

Area	Estimated White-Tailed Deer	Estimated Feral Hogs
Poesta Creek Watershed	1,207	2,105

On-site Sewage Facilities

The estimated number of OSSFs in the TMDL watershed was determined using data supplied by 911 address points to estimate residential locations (TNRIS, 2021). OSSFs were estimated to be residential and business addresses that were outside of city boundaries and Certificate of Convenience and Necessity areas (PUC, 2022). Data from these sources indicate that there are 1,102 OSSFs located within the Poesta Creek watershed (Figure V-6). Several pathways of the liquid waste in OSSFs afford opportunities for bacteria to enter ground and surface waters, if the systems are not properly operating. Properly designed and operated, however, OSSFs would be expected to contribute virtually no fecal bacteria to surface waters.

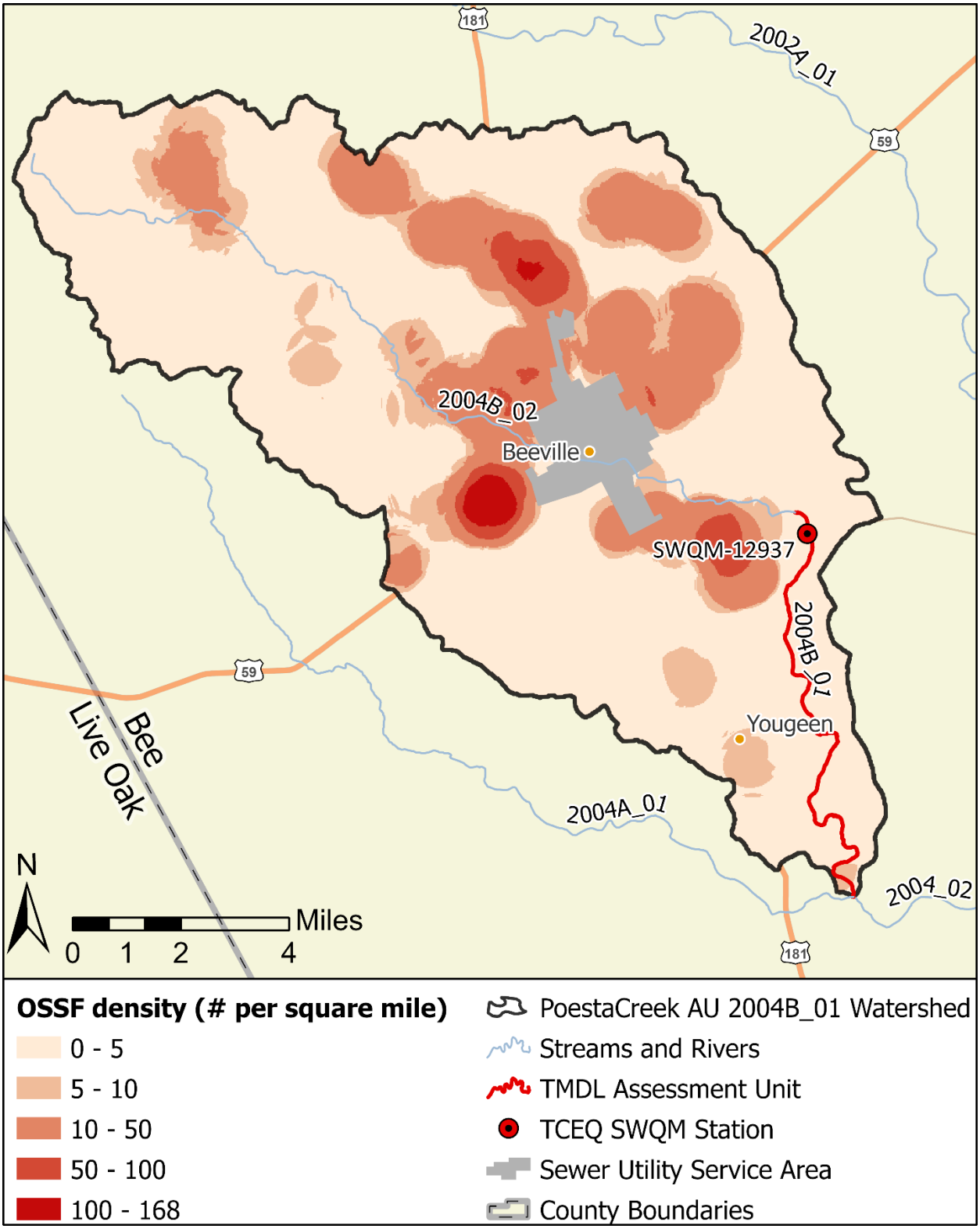

Figure V-6. OSSF densities located within the TMDL watershed

Linkage Analysis

The load duration curve (LDC) method was used to examine the relationship between instream water quality and the source of indicator bacteria loads. Inherent to the use of LDCs as the mechanism of linkage analysis is the assumption of a one-to-one relationship between instream loadings and loadings originating from point sources as regulated and from the landscape as unregulated sources. Further, this one-to-one relationship was also inherently assumed when using the LDC to define the TMDL pollutant load allocation. The LDC method allows for estimation of TMDL loads by utilizing the cumulative frequency distribution of streamflow and measured pollutant concentration data (Cleland, 2003). In addition to estimating stream loads, this method allows for the determination of the hydrologic conditions under which impairments are typically occurring, can give indications of the broad origins of the bacteria (i.e., point or nonpoint source), and provides a means to allocate allowable loadings. The technical support document for this addendum (Jain and Schramm, 2023) provides details about the linkage analysis along with the LDC method and its application.

Two separate LDCs were generated for the TMDL watershed. The first LDC utilized *E. coli* data at TCEQ SWQM Station 12937. The *E. coli* event data plotted on the LDC for TCEQ SWQM Station 12937 in Figure V-7 show exceedances of the geometric mean criterion have commonly occurred regardless of streamflow conditions. The allowable load at the single sample criterion (399 cfu/100 mL) is included on the LDC for comparison with individual *E. coli* samples, although it is not used for assessment or allocation purposes. Since TCEQ SWQM Station 12937 is located near the upstream potion of the AU, a second LDC was generated at the AU 2004B_01 watershed outlet for a more appropriate estimate of flows in the watershed (Figure V-8). Bacteria data is not available at the AU 2004B_01 watershed outlet however having an appropriate estimate of flows and allowable pollutant loads will result in a more accurate TMDL calculation.

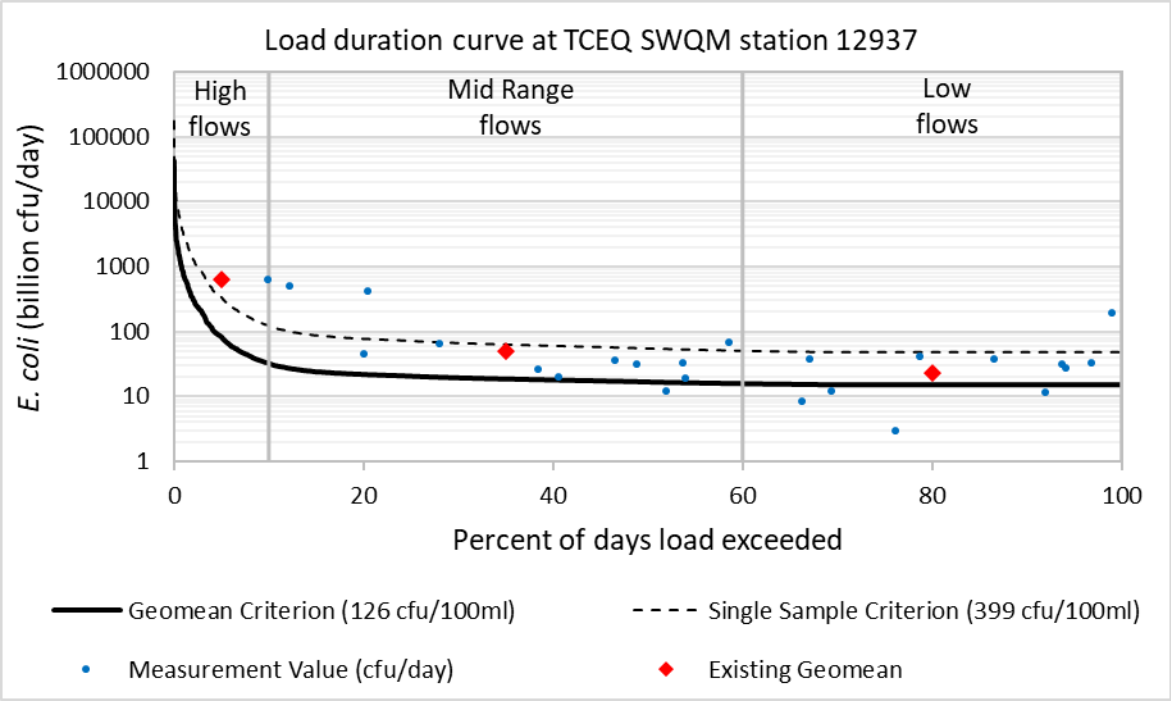

Figure V-7. LDC for TCEQ SWQM Station 12937

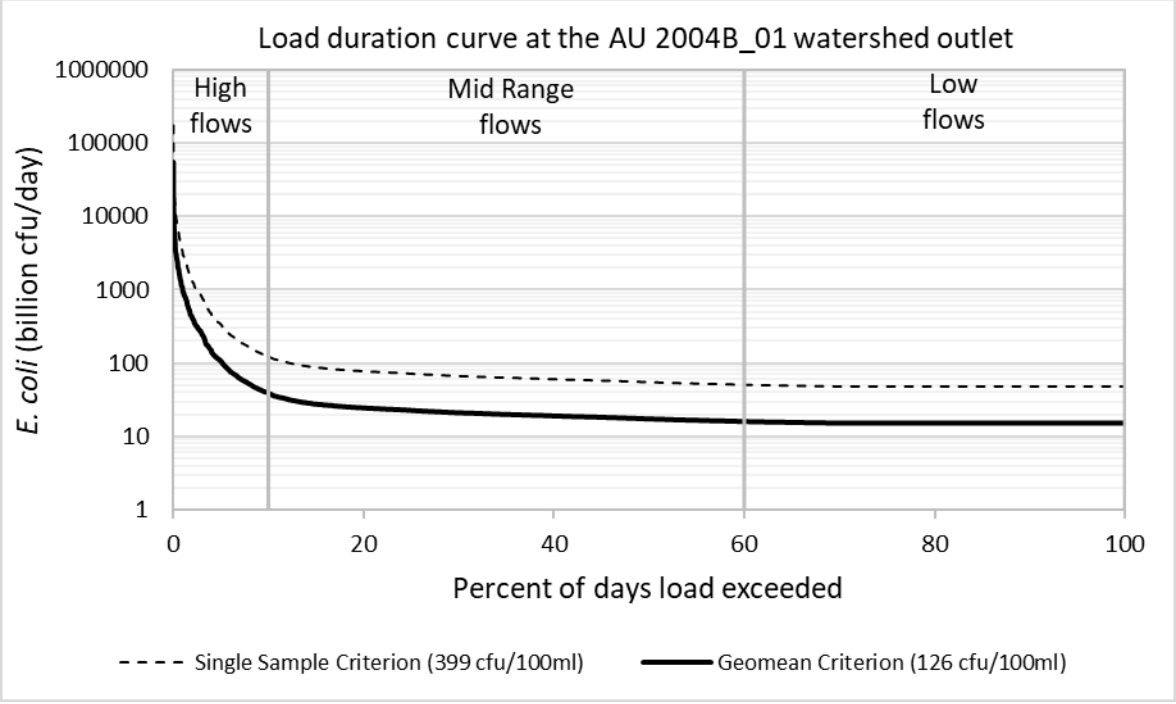

Figure V-8. LDC at the AU 2004B_01 watershed outlet

Margin of Safety

The margin of safety (MOS) is designed to account for any uncertainty that may arise in specifying water quality control strategies for the complex environmental processes that affect water quality. Quantification of this uncertainty, to the extent possible, is the basis for assigning an MOS. The TMDL in this report incorporates an explicit MOS of 5% of the total TMDL allocation.

Pollutant Load Allocation

The TMDL represents the maximum amount of a pollutant that the stream can receive in a single day without exceeding water quality standards. The pollutant load allocations for the selected scenarios were calculated using the following equation:

TMDL = WLA + LA + FG + MOS

Where:

WLA = wasteload allocations, the amount of pollutant allowed by regulated dischargers

LA = load allocations, the amount of pollutant allowed by unregulated sources

FG = loadings associated with future growth from potential regulated facilities

MOS = margin of safety load

For the remainder of this report some calculations have been rounded and may not lead to the exact final amounts listed in the text, tables, or figures.

AU-Level TMDL Calculation

To be consistent with previously completed TMDLs in the original watershed, the TMDL for AU 2004B_01 was derived using the median flow within the high flow regime (or 5% load duration exceedance) of the LDC developed for the AU 2004B_01 watershed outlet. The TMDL watershed outlet was used rather than TCEQ SWQM Station 12937 because it best represents the hydrologic influences for the entire watershed whereas the SWQM station is located near the upstream boundary of the AU 2004B_01 watershed. A separate LDC was developed for TCEQ SWQM Station 12937 using available bacteria data and estimated flows to draw conclusions about linkages between broad sources of loadings and pollutant exceedances.

Margin of Safety Calculation

The TMDL in this report incorporates an explicit MOS of 5%.

Wasteload Allocation

The WLA is the sum of loads from regulated sources, which are WWTFs and regulated stormwater.

Wastewater Treatment Facilities

TPDES-permitted WWTFs are allocated a daily wasteload (WLA_{WWTF}) calculated as their full permitted discharge flow rate multiplied by the instream geometric mean criterion (126 cfu/100 mL for *E. coli*). Table V-8 presents the WLAs for the WWTFs.

Table V-8. WLAs for TPDES-permitted facilities

AU	TPDES Number	Permittee	Bacteria Limit (cfu/100 mL *E. coli*)	Full Permitted Flow (MGD)	WLA_{WWTF} (billion cfu/day *E. coli*)
2004B_02	WQ0010124002	Moore Street WWTP	120	3.0	13.593

Regulated Stormwater

Stormwater discharges from MS4, industrial, and construction areas are also considered regulated point sources. Therefore, the WLA calculations must also include an allocation for regulated stormwater discharges (WLA_{SW}). The percentage of the land area included in the project watershed that is under the jurisdiction of stormwater permits is used to estimate the amount of the overall runoff load that should be allocated as the permitted stormwater contribution in the WLA_{SW} component.

Acreages associated with MSGP authorizations (30.43 acres), and CGP authorizations (42.138 acres) were estimated by importing location information into GIS and measuring the estimated disturbed area from available aerial imagery. The percentage of land under the jurisdiction of stormwater permits (a total of 72.568 acres) in the TMDL watershed is 0.0921%.

Load Allocation

The load allocation (LA) component of the TMDL corresponds to direct nonpoint runoff and is the difference between the total load from stormwater runoff and the portion allocated to WLA_{SW}.

Allowance for Future Growth

The future growth (FG) component of the TMDL equation addresses the requirement of TMDLs to account for future loadings that might occur as a result of population growth,

changes in community infrastructure, and development. Specifically, this TMDL component takes into account the probability that new flows from WWTF discharges may occur in the future. The assimilative capacity of water bodies increases as the amount of flow increases. The allowance for FG in this TMDL report will result in protection of existing uses and conform to Texas' antidegradation policy.

The FG component was based on population projections and current permitted wastewater dischargers for the entire TMDL watershed. Recent population and projected population growth between 2020 and 2070 for the TMDL watershed are provided in Table V-2. The projected population percentage increase within the watershed was multiplied by the corresponding WLA_{WWTF} to calculate FG. Similar to WLA_{WWTF} calculations, the water quality criterion (126 cfu/100mL) after accounting for the required reductions for MOS is used as the WWTF target. The permitted flows were increased by the expected population growth between 2020 and 2070 to determine the estimated future flows.

FG of existing or new point sources is not limited by this TMDL as long as the sources do not cause bacteria to exceed the limits. The assimilative capacity of water bodies increases as the amount of flow increases. Consequently, increases in flow allow for increased loadings. The LDC and tables in this TMDL report will guide determination of the assimilative capacity of the water body under changing conditions, including FG.

Summary of TMDL Calculations

Table V-9 summarizes the TMDL calculations for the TMDL watershed. The TMDL was calculated based on the median flow in the 0-10 percentile range (5% exceedance, high flow regime) from the LDC developed for the AU 2004B_01 watershed outlet. Allocations are based on the current geometric mean criterion for *E. coli* of 126 cfu/100 mL for each component of the TMDL.

Table V-9. TMDL allocation summary

All loads expressed as billion cfu/day *E. coli*

Water Body	AU	TMDL	MOS	WLA_{WWTF}	WLA_{SW}	LA	FG
Peosta Creek	2004B_01	106.383	5.319	13.593	0.080	86.533	0.858

The final TMDL allocations (Table V-10) needed to comply with federal requirements include the FG component within the WLA_{WWTF} (40 CFR Section 103.7).

Table V-10. Final TMDL allocation

All loads expressed as billion cfu/day *E. coli*

Water Body	AU	TMDL	MOS	WLA_{WWTF}	WLA_{SW}	LA
Poesta Creek	2004B_01	106.383	5.319	14.451	0.080	86.533

Seasonal Variation

Federal regulations require that TMDLs account for seasonal variation in watershed conditions and pollutant loading [40 CFR Section 130.7(c)(1)]. Analysis of the seasonal differences in indicator bacteria concentrations were assessed by comparing *E. coli* concentrations obtained from 15 years (2008-2022) of routine monitoring data collected in the warmer months (May through September) against those collected during the cooler months (November through March). The months of April and October were considered transitional between warm and cool seasons and were excluded from the seasonal analysis. Differences in *E. coli* concentrations obtained in warmer versus cooler months were then evaluated by performing a Wilcoxon Rank Sum test (also known as the "Mann-Whitney" test). This analysis of *E. coli* data indicated that there was no significant difference (α=0.05) in indicator bacteria between cool and warm weather seasons for Poesta Creek (p=0.07852). Seasonal variation was also addressed by using all available flow and indicator bacteria records (covering all seasons) from the period of record used in LDC development for this project.

Public Participation

TCEQ maintains an inclusive public participation process. From the inception of TMDL development, the project team sought to ensure that stakeholders were informed and involved. Communication and comments from the stakeholders in the watershed strengthen TMDL projects and their implementation.

The technical support document for this TMDL addendum (Jain and Schramm, 2023) was published on the TCEQ website on Dec. 4, 2023. Project staff presented information about this addendum at an online meeting of the Mission and Aransas Rivers stakeholder group on Aug. 17, 2023. The public had an opportunity to comment on this addendum during the public comment period (Feb. 9 through March 12, 2024) for the WQMP update in which this addendum is included. Notice of the public comment period for this addendum was emailed to stakeholders and posted on the TCEQ's TMDL Program News webpage.[4] Notice of the comment period, along with the document, was also posted on the WQMP Updates webpage.[5] TCEQ accepted public comments on the

[4] www.tceq.texas.gov/waterquality/tmdl/tmdlnews.html
[5] www.tceq.texas.gov/permitting/wqmp/WQmanagement_updates.html

original TMDL report from Oct. 23 through Nov. 23, 2015. Two comments were submitted, and neither of them referred directly to the AU in this TMDL addendum.

Implementation and Reasonable Assurance

The water body covered by this addendum is within the existing bacteria TMDL watersheds for the Mission and Aransas Rivers, which drain to Copano Bay. That TMDL watershed, including Poesta Creek, is within the area covered by the implementation plan (I-Plan) developed by stakeholders for the TMDL watershed, which was approved by the Commission on May 25, 2016. The I-Plan outlines an adaptive management approach in which measures are assessed annually by the stakeholders for efficiency and effectiveness. The iterative process of evaluation and adjustment ensures continuing progress toward achieving water quality goals and expresses stakeholder commitment to the process. Please refer to the original TMDL document for additional information regarding implementation and reasonable assurance.

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