



October 2023 Update to the Texas Water Quality Management Plan

Prepared by
Water Quality Division, Office of Water

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TEXAS COMMISSION ON ENVIRONMENTAL QUALITY • PO BOX 13087 • AUSTIN,
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Prepared by the
Office of Water
Water Quality Division

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Developed in accordance with Sections 205(j), 208,
and 303 of the Clean Water Act
and applicable regulations thereto.

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Introduction

The Texas Water Quality Management Plan (WQMP) is the product of a wastewater treatment facility (WWTF) planning process developed and updated in accordance with provisions of Sections 205(j), 208, and 303 of the federal Clean Water Act (CWA), as amended. The WQMP is an important part of the State's program for accomplishing its clean water goals.¹

The Texas Department of Water Resources, a predecessor agency of the Texas Commission on Environmental Quality (TCEQ), prepared the initial WQMP for waste treatment management during the late 1970s. The CWA mandates that the WQMP be updated as needed to fill information gaps and revise earlier certified and approved plans. Any updates to the plan need involve only the elements of the plan that require modification. The original plan and its subsequent updates are collectively referred to as the "State of Texas Water Quality Management Plan."

The WQMP is tied to the State's water quality assessments that identify priority water quality problems. WQMPs are used to direct planning for implementation measures that control and/or prevent water quality problems. Several elements may be contained in the WQMP, such as effluent limitations of wastewater facilities, total maximum daily loads (TMDLs), nonpoint source management controls, identification of designated management agencies, and groundwater and source-water protection planning. Some of these elements may be contained in separate documents, which are prepared independently of the current WQMP update process, but may be referenced as needed to address planning for water quality control measures.

This document, as with previous updates², will become part of the WQMP after completion of the public comment period, certification by TCEQ, and approval by the United States Environmental Protection Agency (EPA).

The materials presented in this document revise only the information specifically addressed in the following sections. Previously certified and approved WQMPs remain in effect.

¹ See the formal definition of a water quality management plan in Title 40 Code of Federal Regulations (CFR) 130.2(k).

² Fiscal Years 1974, 1975, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984/85, 1986/88, 1989, 1990, 1991, 1992, 1993/94, 1995, 1996, 1997/98, 02/1999, 05/1999, 07/1999, 10/1999, 01/2000, 04/2000, 07/2000, 10/2000, 01/2001, 04/2001, 07/2001, 10/2001, 01/2002, 04/2002, 07/2002, 10/2002, 01/2003, 04/2003, 07/2003, 10/2003, 01/2004, 04/2004, 07/2004, 10/2004, 01/2005, 04/2005, 07/2005, 10/2005, 01/2006, 04/2006, 07/2006, 10/2006, 01/2007, 04/2007, 07/2007, 10/2007, 01/2008, 04/2008, 07/2008, 10/2008, 01/2009, 04/2009, 07/2009, 10/2009, 01/2010, 04/2010, 07/2010, 10/2010, 01/2011, 04/2011, 07/2011, 10/2011, BPUB 2011, 01/2012, 04/2012, 07/2012, 10/2012, 01/2013, 04/2013, 07/2013, 10/2013, 01/2014, 04/2014, 07/2014, 10/2014, 01/2015, 04/2015, 07/2015, 10/2015, 01/2016, 04/2016, 07/2016, 10/2016, 01/2017, 04/2017, 07/2017, 10/2017, 01/2018, 04/2018, 07/2018, 10/2018, 01/2019, Terra Verde 2019, 04/2019, 07/2019, 10/2019, 01/2020, 04/2020, 07/2020, 10/2020, 01/2021, 04/2021, 07/2021, 10/2021, 01/2022, 04/2022, 07/2022, 10/2022, 01/2023, 04/2023, and 7/2023.

The October 2023 WQMP update addresses the following topics for water quality planning purposes:

1. Projected Effluent Limits Updates
2. Service Area Population for Municipal WWTFs
3. Designation of Management Agencies for Municipal WWTFs
4. TMDL Updates

The public comment period for the draft October WQMP update was from November 10, 2023 through December 14, 2023.

The “Projected Effluent Limit Update” section provides information compiled from August 1, 2023 through October 31, 2023, and is based on Texas water quality standards (WQS). Projected effluent limits may be used for water quality planning purposes in Texas Pollutant Discharge Elimination System (TPDES) permit actions.

The “Service Area Population” and “Designation of Management Agencies” sections for municipal wastewater facilities were developed and evaluated by TCEQ in cooperation with the Texas Water Development Board (TWDB) and regional water quality management planning agencies.

The “Total Maximum Daily Load Update” section provides information on proposed wasteload allocations (WLAs) for new dischargers and revisions to existing TMDLs and was developed by the TCEQ TMDL Program in the Water Quality Planning Division.

Projected Effluent Limit Updates

Table 1 reflects proposed effluent limits for new dischargers and preliminary revisions to original proposed effluent limits for preexisting dischargers. Abbreviations used in the table heading include:

- BOD₅–5-Day Biochemical Oxygen Demand
- CBOD₅–5-Day Carbonaceous Biochemical Oxygen Demand
- DO–Dissolved Oxygen
- lbs/day–Pounds per Day
- MGD–Million Gallons per Day
- mg/L–Milligrams per Liter
- NH₃-N–Ammonia-Nitrogen

Effluent flows indicated in Table 1 reflect future needs and do not reflect current permits for these facilities. These revisions may be useful for water quality management planning purposes. The effluent flows and constituent limits indicated in the table have been preliminarily determined to be appropriate to satisfy the stream standards for dissolved oxygen in their respective receiving waters. These flow volumes and effluent sets may be modified at the time of permit action. These limits are based on the Texas WQS effective at the time of the production of this update. The WQS are subject to revision on a triennial basis.

Table 1. Projected Effluent Limit Updates

State Permit Number	Segment Number	EPA ID Number	Permittee Name and County	Flow (MGD)	CBOD₅ (mg/L)	CBOD₅ (lbs/day)	NH₃-N (mg/L)	NH₃-N (lbs/day)	BOD₅ (mg/L)	BOD₅ (lbs/day)	DO (mg/L)	Months/ Comments
10410-003	2424	TX0114821	City of La Marque Galveston	6.0	7	350.28	2	100.08			5	
10779-001	2421	TX0027260	City of Morgan's Point Harris	0.45	10	37.53	3	11.26			4	
13048-001	1241	TX0144983	City of Post Garza	0.7	10	58.38	3	17.51			4	Outfalls 001 and 002
13548-001	1434	TX0125334	Corix Utilities (Texas), Inc. Bastrop	2.0	5	83.40	2	33.36			5	
13760-001	1004	TX008972	Montgomery County MUD No. 56 Montgomery	0.34	10	28.36	3	8.51			6	
14060-001	1810	TX0114821	Spanish Trail Utility Company LLC Hays	0.6	5	25.02	2	10.01			4	
14129-002	1434	TX0137448	City of Manor Travis	0.8	5	33.36	2	13.34			5	
14724-003	1108	TX0129470	Brazoria County MUD No. 55 Brazoria	1.2	10	100.08	3	30.02			6	
15025-001	1402	TX0133337	Town of Round Top Fayette	0.036					10	3.00	4	

State Permit Number	Segment Number	EPA ID Number	Permittee Name and County	Flow (MGD)	CBOD ₅ (mg/L)	CBOD ₅ (lbs/day)	NH ₃ -N (mg/L)	NH ₃ -N (lbs/day)	BOD ₅ (mg/L)	BOD ₅ (lbs/day)	DO (mg/L)	Months/ Comments
16315-001	1434	TX0144304	Lanzola MHP4 S1 Bastrop	0.32	5	13.34	2	5.34			4	
16332-001	1015	TX0144436	Crown Oaks Dr, LLC Montgomery	0.05	10	4.17	3	1.25			4	
16333-001	1202	TX0144509	Woodmere Development COLTD + BGM Land Investments Ltd. Waller	0.3	5	12.51	2	5.00			6	
16334-001	1009	TX0144444	Harris County MUD No. 531 Harris	0.1	10	8.34	3	2.50			4	
16341-001	1004	TX0144525	MC Gulf Coast LP Montgomery	0.26	10	21.68	3	6.51			6	
16342-001	2493	TX0144533	Space Exploration Technologies Corp. Cameron	0.2	10	16.68	3	5.00			4	
16347-001	1009	TX0144550	Joseph Rd WWTP LLC Waller	0.2	10	16.68	3	5.00			5	
16351-001	1248	TX0144592	East Williamson County MUD No. 1 Williamson	0.6	5	25.02	2	10.01			4	

State Permit Number	Segment Number	EPA ID Number	Permittee Name and County	Flow (MGD)	CBOD ₅ (mg/L)	CBOD ₅ (lbs/day)	NH ₃ -N (mg/L)	NH ₃ -N (lbs/day)	BOD ₅ (mg/L)	BOD ₅ (lbs/day)	DO (mg/L)	Months/ Comments
16354-001	0821	TX0144606	TCCI Montgomery Gardens, LLC. Collin	0.15	10	12.51	3	3.75			5	
16357-001	1202	TX0144631	Quadvest LP Waller	0.5	10	41.70	3	12.51			4	
16358-001	1008	TX0144649	North Catch 1488 LLC Waller	0.225	10	18.77	3	5.63			4	
16359-001	1016	TX0144657	PR-Park Ridge Apartments LLC Harris	0.0061	10	0.51	3	0.15			6	
16360-001	1103	TX0144665	Clear Utilities LLC Galveston	0.075	10	6.26	3	1.88			4	
16361-001	1213	TX0144673	NMV Hackberry Utility LLC & NMV Hackberry Lane Property Investors LLC Bell	0.99	5	41.28	2	16.51			6	
16364-001	1213	TX0144703	Armstrong Loop Utility LLC & Armstrong Loop Salado Property Investors LLC Bell	0.99	5	41.28	2	16.51			6	

State Permit Number	Segment Number	EPA ID Number	Permittee Name and County	Flow (MGD)	CBOD ₅ (mg/L)	CBOD ₅ (lbs/day)	NH ₃ -N (mg/L)	NH ₃ -N (lbs/day)	BOD ₅ (mg/L)	BOD ₅ (lbs/day)	DO (mg/L)	Months/ Comments
16366-001	0204	TX0144738	Montague County Montague	0.01	10	0.83	3	0.25			4	
16368-001	1227	TX0144754	South Central Water Company Johnson	0.7	10	58.38	2	11.68			4	
16369-001	0823	TX0144762	South Central Water Company Denton	0.95	10	79.23	2	15.85			4	
16371-001	1008	TX0144746	Willow Investment Partners, LP Harris	0.05	10	4.17	3	1.25			4	
16372-001	1244	TX0144771	LLIJ LLC Williamson	0.006	10	0.50	3	0.15			4	
16375-001	1108	TX0144819	Sandy Point DEV Owner LP Brazoria	0.6	10	50.04	3	15.01			6	
16376-001	1434	TX0144835	45 Williamson LLC Travis	0.75	5	31.28	2	12.51			5	
16377-001	1242	TX0144843	TB College Station Dev LLC Brazos	0.12	10	10.01	3	3.00			4	
16380-001	1009	TX0144851	JDI Spring Cypress SPE, LLC Harris	0.05	10	4.17	3	1.25			6	

State Permit Number	Segment Number	EPA ID Number	Permittee Name and County	Flow (MGD)	CBOD ₅ (mg/L)	CBOD ₅ (lbs/day)	NH ₃ -N (mg/L)	NH ₃ -N (lbs/day)	BOD ₅ (mg/L)	BOD ₅ (lbs/day)	DO (mg/L)	Months/ Comments
16381-001	1008	TX0144860	Harris County MUD No. 588 Harris	0.3	10	25.02	2	5.00			6	
16382-001	1008	TX0144878	Greenwood Land Holdings, LLC Harris	0.24	10	20.02	3	6.00			4	
16385-001	1808	TX0144886	South Central Water Company Caldwell	0.95	7	55.46	2	15.85			4	
16386-001	1228	TX0144908	JC Water Resource Recovery Facility, LLC Johnson	0.108	10	9.01	3	2.70			4	
16387-001	0704	TX0144916	QT South, LLC Jefferson	0.007	10	0.58	3	0.18			4	
16388-001	0815	TX0144932	Stephen Richard Selinger Ellis	0.405					10	33.78	4	
16389-001	1302	TX0144941	Sealy 922 LLC Austin	0.625	5	26.06	1.3	6.78			6	
16391-001	1244	TX0144967	Wilco-Thrall 79 WWTP LLC Williamson	3.0	5	125.10	1	25.02			6	
16392-001	0823	TX0144975	City of Celina Collin	10	5	417.00	1.7	141.78			6	

State Permit Number	Segment Number	EPA ID Number	Permittee Name and County	Flow (MGD)	CBOD ₅ (mg/L)	CBOD ₅ (lbs/day)	NH ₃ -N (mg/L)	NH ₃ -N (lbs/day)	BOD ₅ (mg/L)	BOD ₅ (lbs/day)	DO (mg/L)	Months/ Comments
16397-001	0802	TX0145009	Tall Pine Environmental, LLC Polk	0.06	10	5.00	3	1.50			6	
16414-001	1229	TX0145131	Bluff Dale ISD Erath	0.1	10	8.34	3	2.50			4	

Planning Information Summary

The Water Quality Planning Division of TCEQ coordinated with TWDB and regional planning agencies to compile the wastewater facility information in this section. Domestic facility financing decisions under the State Revolving Fund (SRF) loan program must be consistent with the certified and approved WQMP.

The purpose of this section is to present data reflecting facility-planning needs, including previous water quality management plan needs requiring revision. Data are also presented to update other plan information for TWDB's SRF projects. Table 2 contains the updated service area population information. The table is organized in alphabetical order and includes the following 10 categories of information:

1. Planning Area – Area for which facility needs are proposed. The facility planning areas are subject to change during the facility planning process and any such changes will be documented in a later water quality management plan update. All planning areas listed are also designated management agencies (DMAs) unless otherwise noted in the “Comments” column.
2. Service Area – Area that receives the provided wastewater service.
3. Needs – A “T” indicates a need for either initial construction of a WWTF, additional treatment capacity, or the upgrading of a WWTF to meet existing or more stringent effluent requirements. A “C” indicates a need for improvements to, expansion of, rehabilitation of, or the initial construction of a wastewater collection system in the facility planning area. “T/C” indicates a need for both treatment and collection system facilities. More detailed facility planning conducted during a construction project may define additional needs and those needs will be reflected in a future update to the WQMP. A “F” indicates a need for flood mitigation.
4. Needs Year – The year in which the needs were identified for the planning area.
5. Basin Name – The river basin or designated planning entity for a designated planning area. The seven water quality management planning areas designated by the Governor are each administered by a Council of Governments (COG), a Development Council (DC), or a Planning Council (PC). Basin names are shown for areas outside one of these planning areas. The designated planning areas and their associated administering entities are:
 - a. Corpus Christi – Coastal Bend COG (CBCOG)
 - b. Killeen-Temple – Central Texas COG (CTCOG)
 - c. Texarkana – Ark-Tex COG (ATCOG)
 - d. Southeast Texas – South East Texas Regional Planning Council (SETRPC)
 - e. Lower Rio Grande Valley – Lower Rio Grande Valley Development Council (LRGVDC)
 - f. Dallas-Fort Worth – North Central Texas COG (NCTCOG)

g. Houston – Houston-Galveston Area Council (H-GAC)

6. Segment – The classified stream segment or tributary into which any recommended facility may discharge existing or projected wastewater. In the case of no-discharge facilities, this is the classified stream segment drainage area in which the facilities are located.
7. County – The county in which the facility planning area is located.
8. Date – The date the planning information was reviewed by TCEQ.
9. Comments – Additional explanation or other information concerning the facility planning area.
10. Population – The base year and projected populations for each facility planning area. Population projections presented are consistent with the latest available statewide population projections or represent the most current information obtained from facility planning analyses.

The facility information in this section is intended to be used in the preparation of facility plans and the subsequent design and construction of wastewater facilities. Design capacities of the treatment and collection systems will be based upon the population projections contained in this document, plus any additional needed capacity established for commercial/industrial flows and documented infiltration/inflow volumes (treatment or rehabilitation).

The probable needs shown under the “Needs” heading are preliminary findings; specific needs for an area must be as established in the completed and certified, detailed engineering studies conducted during facility planning under the SRF and other state loan programs.

Specific recommended effluent quality for any wastewater discharges resulting from any of the facilities in this document will be in accordance with the rule in the Texas WQS in effect at the time the permit is issued for a specific facility.

Table 2. Service Area Population Updates

Planning Agency	Service Area	Needs	Needs Year	Basin Name / COG	Segment	County	WQMP Date	Comments	Year	Population
City of Marble Falls	Project Service Area	T/C	2029	Colorado	NA	Burnet	7/10/2023		2021	7037
									2030	15344
									2035	19016
									2040	22759
City of Donna	Project Service Area	T/C	2050	Nueces-Rio Grande Coastal	2202	Hidalgo	8/10/2023		2023	21473
				LRGVDC					2030	24860
									2040	29719
									2050	34587
Harlingen Water Works System	Utility boundary	T/C	2040	Nueces-Rio Grande Coastal	2202	Cameron	8/10/2023		2020	63000
				LRGVDC					2030	74398
									2035	80766
									2040	87627

Designated Management Agencies

To be designated as a management agency for wastewater collection or treatment, an entity must demonstrate the legal, institutional, managerial and financial capability necessary to carry out the entity's responsibilities in accordance with Section 208(c) of the CWA (see below list of requirements). Before an entity can apply for an SRF loan, it must be recommended for designation as the management agency in the approved WQMP.

Designation as a management agency does not require the designated entity to provide wastewater services, but enables it to apply for grants and loans to provide those services. The facilities listed in Table 3 have submitted DMA resolutions to TCEQ. TCEQ submits this DMA information to EPA for approval as an update to the WQMP.

Section 208(c)(2) Requirements for Management Agency

208(c)(2)(A): to carry out portions of an area-wide waste treatment plan.

208(c)(2)(B): to manage waste treatment works.

208(c)(2)(C): directly or by contract to design and construct new works.

208(c)(2)(D): to accept and utilize grants.

208(c)(2)(E): to raise revenues, including assessment of waste treatment charges.

208(c)(2)(F): to incur short and long term indebtedness.

208(c)(2)(G): to assure community pays proportionate cost.

208(c)(2)(H): to refuse to receive waste from non-compliant dischargers.

208(c)(2)(I): to accept for treatment industrial wastes.

Table 3. Designated Management Agencies

Planning Agency	Service Area	DMA Needs	DMA Date
City of Marble Falls	Project Service Area	T/C	12/19/2022
City of Donna	Project Service Area	T/C	12/16/2022
Harlingen Water Works System	Utility boundary	T/C	1/25/2023

Total Maximum Daily Load Revisions

The TMDL Program works to improve water quality in impaired or threatened water bodies in Texas. The program is authorized by and created to fulfill the requirements of Section 303(d) of the federal CWA.

The goal of a TMDL is to restore the full use of a water body that has limited quality in relation to one or more of its uses. The TMDL defines an environmental target, and based on that target, TCEQ and stakeholders develop an implementation plan with wasteload allocations for point source dischargers to mitigate human-caused sources of pollution within the watershed and restore full use of the water body.

TMDLs are developed based on intensive data collection and scientific analysis. After adoption by TCEQ, TMDLs are submitted to EPA for review and approval.

The attached appendixes may reflect proposed wasteload allocations for new dischargers and/or additions or revisions to TMDLs. Updates and addendums will be provided in the same units of measure used in the original TMDL document and will include the segment and assessment unit (AU) numbers of the affected segments. Also, note that for bacteria TMDLs, loads will typically be expressed as colony-forming units per day (cfu/day). On occasion, other expressions may be used due to different laboratory methods, such as counts or most probable number per day. For the purposes of the TMDL program, these terms are considered to be synonymous.

Appendix I. Updates to Eight Total Maximum Daily Loads for Indicator Bacteria in Dickinson Bayou and Three Tidal Tributaries

Segments 1103, 1103A, 1103B and 1104

This appendix provides updates to TMDLs previously submitted through the state's WQMP for: Dickinson Bayou and Tributaries.

The report, *Eight Total Maximum Daily Loads for Indicator Bacteria in Dickinson Bayou and Three Tidal Tributaries For Segments 1103, 1103A, 1103B and 1104*, was adopted by TCEQ on 02/08/12 and approved by EPA on 06/06/12. Upon EPA approval, the TMDLs became part of the state's WQMP.

The Texas WQMP has since been updated two times prior to this update for this TMDL. The previous updates have revised the list of individual WLAs in the original TMDL document. Additionally, TCEQ submitted an addendum to the original TMDL in the July 2016 WQMP update. This addendum added three new AUs to the original TMDL project. A second addendum was submitted and added to the original TMDL in the April 2022 WQMP update. This second addendum added two new AUs to the original TMDL project.

The purpose of this update is to make the following changes to the TMDL (presented in Table I-1):

- add one new permit, and
- remove one cancelled permit

The changes reflected in this update resulted in the shifting of allocations for the sum of the individual WLAs in one AU. The original TMDL provided no allotment for future growth (FG) for AU 1103_04, however, the original TMDL document stipulates that FG from existing or new permitted facilities would not be limited by the TMDLs as long as the sources do not exceed the concentration limit. The original TMDL has a concentration limit for one-half the geometric mean criterion for indicator bacteria (63 MPN/dL for *Escherichia coli* (*E. coli*) and 17.5 MPN/dL for Enterococci). The new permit (16360-001/TX0144665) discharging into AU 1103_04 adheres to this criterion for Enterococci. Because there is no FG component in AU 1103_04, the total amount exceeded was added directly to the overall TMDL allocation for the one AU, which has been updated in Table I-2.

Table I-1 - Changes to individual WLAs for the TMDL watershed

Updates Table 18, p. 39 in the original TMDL document.

The WLA is expressed in MPN/day Enterococci.

State Permit Number	Outfall	EPA Permit Number	AU	Permittee Name	Flow (MGD)	Indicator Bacteria	WLA	TMDL Comments
16360-001	001	TX0144665	1103_04	CLEAR UTILITIES LLC	0.075	Enterococci	4.97E+07	New permit
14804-001	001	TX0129631	N/A ^a	SOUTH CENTRAL WATER COMPANY	N/A	N/A	N/A	Cancelled permit

^a Cancelled permit does not affect any of the original TMDL AUs.

Table I-2 - TMDL summary calculations for one AU in the TMDL watershed

Updates Table 20, p. 44 in the original TMDL document.

All loads expressed as MPN/day.

AU	Indicator Bacteria	Segment Name	TMDL	WLA WWTF	WLA SW	LA	MOS	FG
1103_04	Enterococci	Dickinson Bayou Tidal	6.75E+10	9.94E+07	2.69E+10	3.71E+10	3.37E+09	0.00E+00

Additionally, Table I-3 below provides an update to Table 11 found in the July 2016 addendum to this TMDL project (*Addendum One to Eight Total Maximum Daily Loads for Indicator Bacteria in Dickinson Bayou and Three Tidal Tributaries: Three Total Maximum Daily Loads for Indicator Bacteria in Dickinson Bayou For AUs 1103_01, 1103D_01, and 1103E_01*). One of the permits discussed earlier in this update affects one AU in this addendum.

Table I-4 below provides updates to Table 12 found in the July 2016 addendum to this TMDL project. The addendum added three AUs that were not included in the original TMDL. The AU affected here (1103_01) was included as the receiving AU to loading from 1103_02 in the original TMDL. One of the permits (14804-001/ TX0129631) affects the loading of AU 1103_01.

In Table 13 of the July 2016 TMDL addendum, the WLAs for permitted facilities are the sum of the individual WLAs and the allowance for FG within the single affected AU. Therefore, these overall numbers did not change, and Table 13 of the TMDL addendum remains the same.

Table I-3 - Changes to individual WLAs in the Dickinson Bayou Tidal watershed

Updates Table 11, p. 23 in the TMDL addendum document.

The WLA is expressed in billion MPN/day Enterococci.

State Permit Number	Outfall	EPA Permit Number	AU	Permittee Name	Flow (MGD)	WLA	TMDL Comments
14804-001	001	TX0129631	1103_01	SOUTH CENTRAL WATER COMPANY	N/A	N/A	Cancelled permit

Table I-4 - TMDL summary calculations for one AU in the Dickinson Bayou Tidal watershed

Updates Table 12, p. 26 in the TMDL addendum document.

All loads expressed as billion MPN/day Enterococci.

Water Body	AU	Indicator Bacteria	TMDL	MOS	WLA WWTF	WLA SW	LA	FG
Dickinson Bayou Tidal	1103_01	Enterococci	922.405	46.12	0.060	148.39	727.068	0.767

Appendix II. Addendum One to Thirteen TMDLs for Indicator Bacteria in the Lower West Fork Trinity River Watershed

Adding one TMDL for 0841I_01

One TMDL for Indicator Bacteria in Dry Branch Creek

Introduction

TCEQ adopted *Thirteen TMDLs for Indicator Bacteria in the Lower West Fork Trinity River Watershed* (TCEQ, 2013) on September 24, 2013. EPA approved the TMDLs on November 7, 2013. This document is the first addendum to the original TMDL report.

This first addendum includes information specific to one additional AU for Dry Branch Creek (AU 0841I_01; also referred to in this addendum as the TMDL watershed). This AU is located within the watershed of the approved original TMDLs for the Lower West Fork Trinity River. 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 TMDL for Indicator Bacteria in Dry Branch Creek](#)^c (Millican and Adams, 2022). 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.

Problem Definition

TCEQ first identified the bacteria impairment for Dry Branch Creek in the *2020 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)* (Texas Integrated Report; TCEQ, 2020). The impairment was identified again in the subsequent 2022 Texas Integrated Report (TCEQ, 2022a), the latest EPA-approved edition. The impaired AU is 0841I_01. The water body includes only one AU. Figure II-1 shows the watershed added in this addendum in relation to the entire watershed of the original TMDLs, which is located within the Trinity River Basin.

^c www.tceq.texas.gov/downloads/water-quality/tmdl/greater-trinity-recreational-66/66j-as-475-dry-branch-bacteria-tsd-2022-oct.pdf

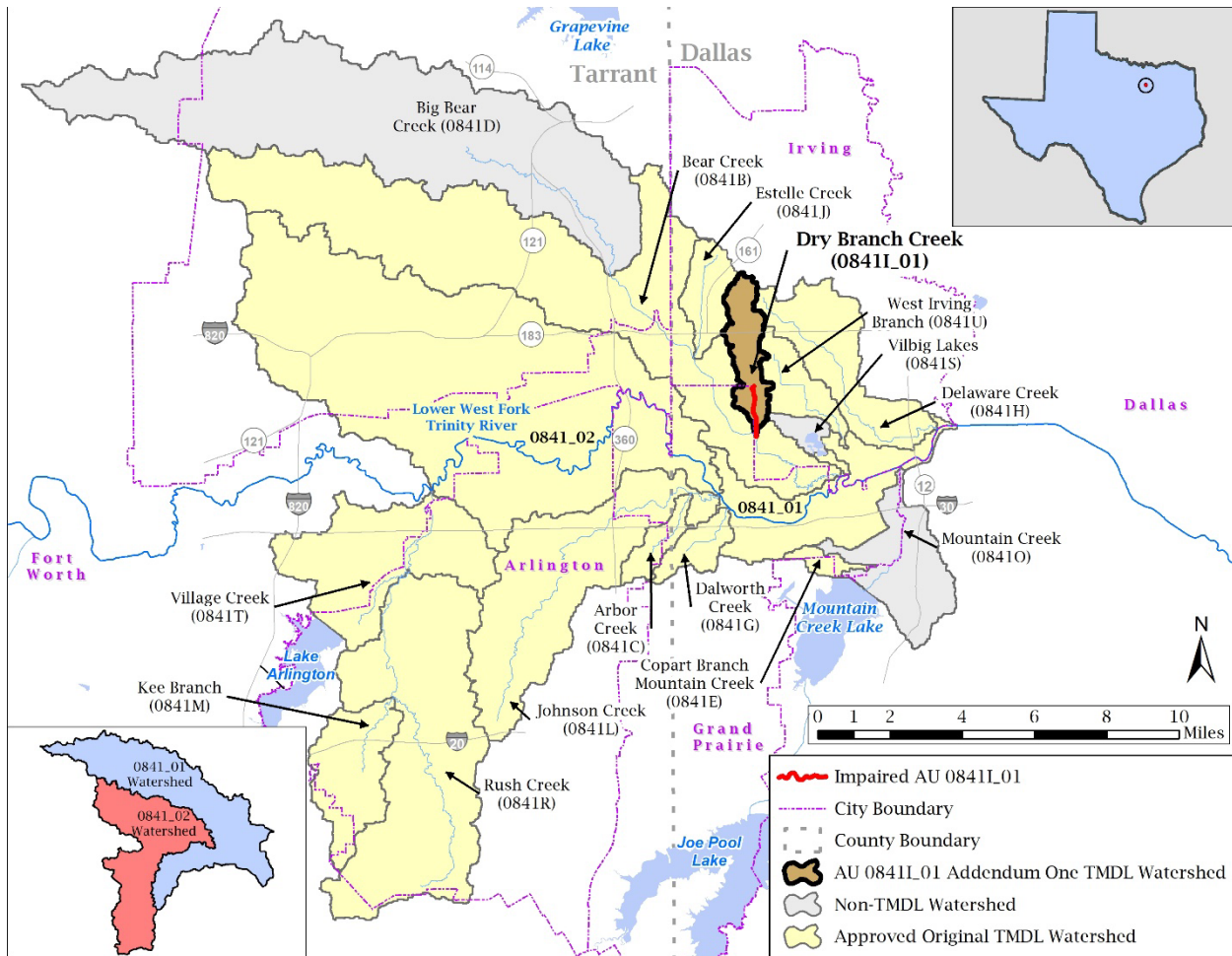


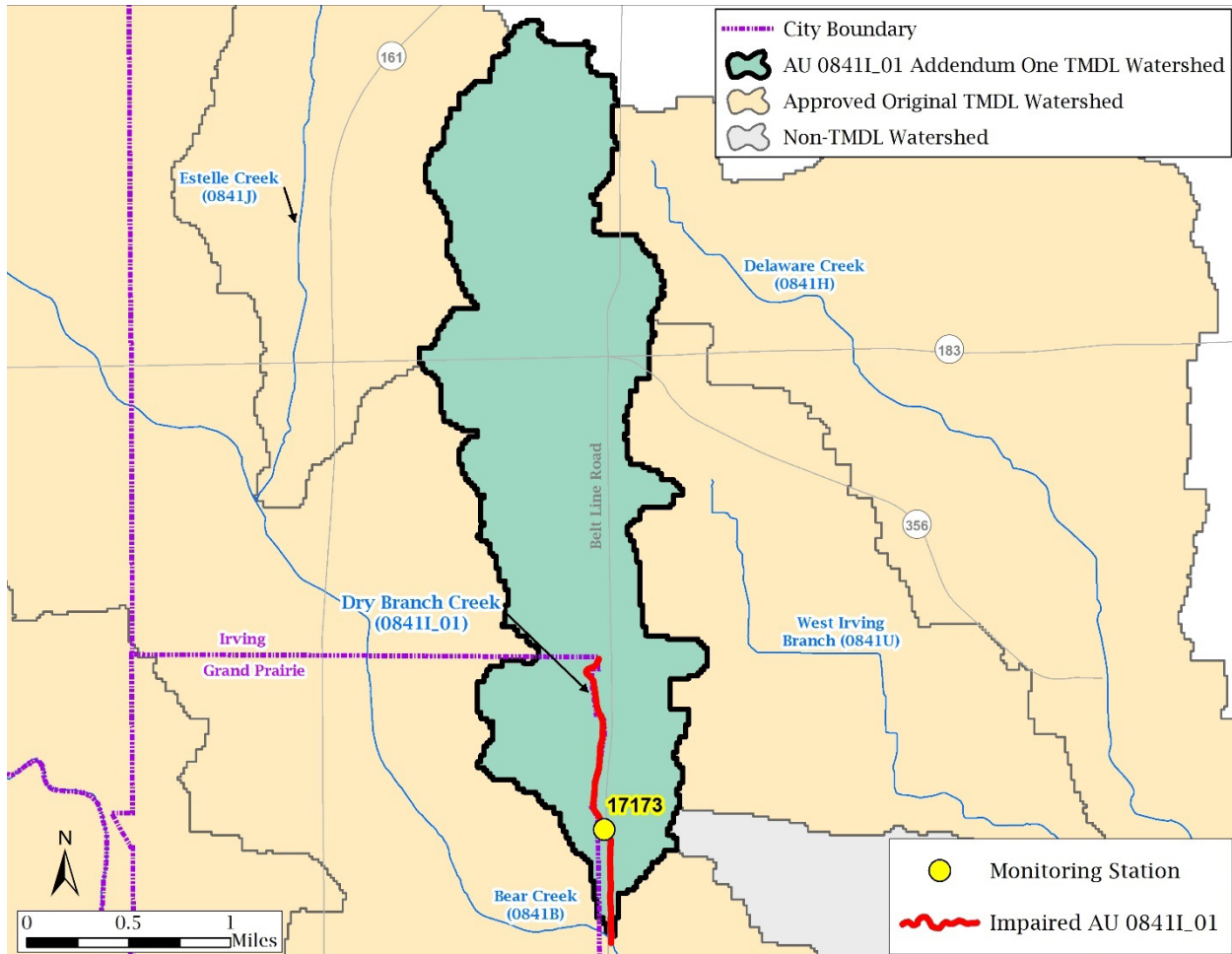
Figure II-1. Map showing the previously approved TMDL watersheds and the Dry Branch Creek 0841L_01 watershed added by this addendum

The Texas Surface Water Quality Standards (TCEQ, 2018) identify 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 2018 Texas Surface Water Quality Standards. *E. coli* is the indicator bacteria for assessing primary contact recreation 1 use in freshwater.

Table II-1 summarizes the ambient water quality data for the TCEQ surface water quality monitoring (SWQM) station on the water body, as reported in the 2022 Texas Integrated Report (TCEQ, 2022a). 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 colony forming units per 100 milliliters (cfu/100 mL) of water. Figure II-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 II-1. 2022 Texas Integrated Report summary

AU	TCEQ SWQM Station	Parameter	Number of Samples	Date Range	<i>E. coli</i> Geometric Mean (cfu/100 mL)
0841I_01	17173	<i>E. coli</i>	37	12/01/2013 – 11/30/2020	416.1

**Figure II-2. Active TCEQ SWQM station**

Watershed Overview

Dry Branch Creek AU 0841I_01 is a tributary to Bear Creek (0841B), which is a tributary to the Lower West Fork Trinity River (0841). The water body is approximately 1.5 miles long, drains 3.4 square miles (2,171 acres), and is located entirely within Dallas County.

The 2022 Texas Integrated Report (TCEQ, 2022a) provides the following water body and AU description:

- Dry Branch Creek AU 0841I_01 – A 1.5 mile stretch of Dry Branch Creek running upstream from confluence with Lower West Fork Trinity to Rock Island Road in Irving, Dallas County.

The AU description for 0841I_01 that is contained in the 2022 Texas Integrated Report (and in previous integrated reports) is not accurate. Dry Branch Creek (0841I_01) is actually a tributary of Bear Creek (0841B), not of the Lower West Fork Trinity River. TCEQ will revise the AU description for 0841I_01 in future editions of the Texas Integrated Report to describe the terminus of AU 0841I_01 at the confluence with Bear Creek (TCEQ, 2022b).

Climate

Weather data were obtained for the 20-year period from January 2002 through December 2021 from the the National Climatic Data Center for the Dallas Fort Worth International Airport (NOAA, 2022). Data from this 20-year period indicate that the average monthly high temperature typically reaches a maximum of 96.8 °F in August, and the average monthly low temperature reaches a minimum of 36.6 °F in January (Figure II-3). Annual rainfall averages 36.2 inches. The wettest month is May (4.9 inches) while July (1.9 inches) is the driest month, with rainfall occurring throughout the year.

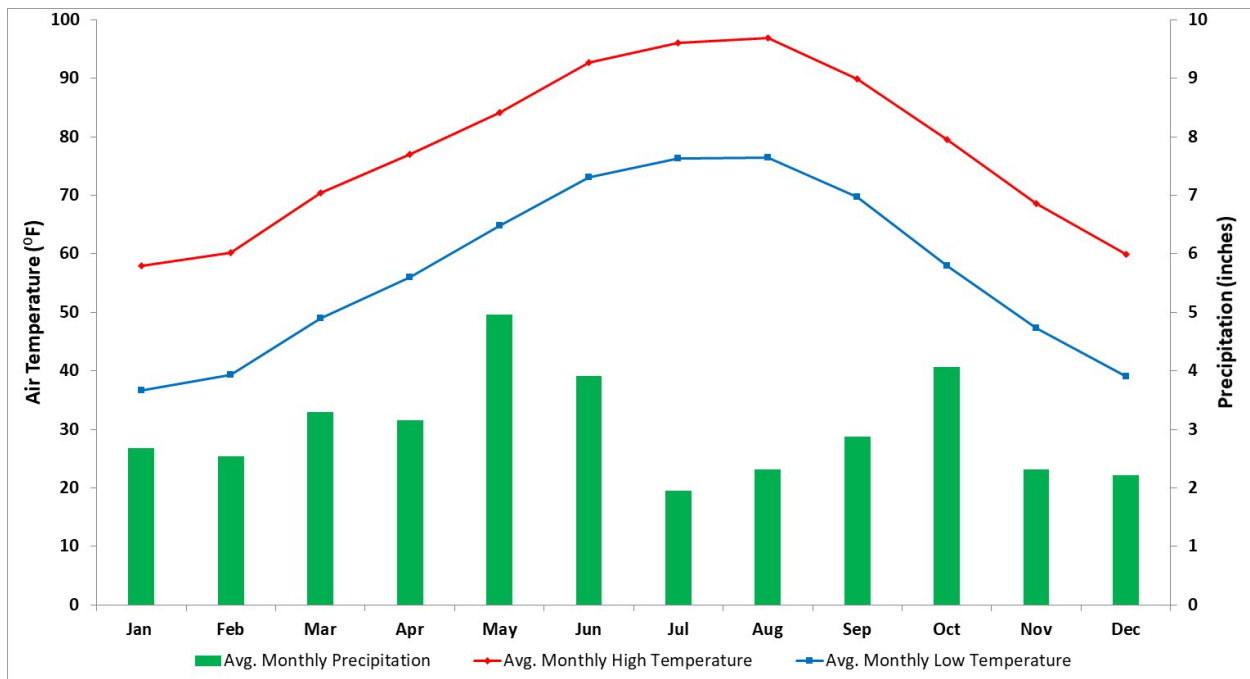


Figure II-3. Average monthly temperature and precipitation (2002-2021) at the Dallas Fort Worth International Airport

Population and Population Projections

The TMDL watershed is located within the municipal boundaries of Irving and Grand Prairie in Dallas County. According to the 2020 United States Census Bureau (USCB) data (USCB, 2021), the TMDL watershed had an estimated population of 20,410 in 2020.

A population projection through 2045 was developed using data from NCTCOG traffic survey zone allocations. Traffic survey zones are planning areas used by NCTCOG to provide for more analysis at a local scale. (NCTCOG, 2017a). Table II-2 provides a summary of the population projection for the TMDL watershed.

Table II-2. 2020 – 2045 population projection

Area	2020 Estimated Population	2045 Projected Population	Projected Population Increase	Percent Change
Dry Branch Creek Watershed	20,410	22,150	1,740	8.5%

The following steps detail the method used to estimate the 2020 and projected 2045 populations in the TMDL watershed.

1. Obtained 2020 USCB data at the block level.
2. Developed the 2020 watershed population using the USCB block level data for the portion of census blocks located within the watershed.
3. For the census blocks that were partially located in the watershed, estimated population by multiplying the block population to the proportion of its area in the watershed.
4. Obtained population projections for the year 2045 from NCTCOG traffic survey zone allocations (NCTCOG, 2017a).
5. Developed population projections using traffic survey zone data for the portion of the traffic survey zones located within the watershed.
6. Subtracted the 2020 watershed population from the 2045 population projection to determine the projected population increase, then divided the projected population increase by the 2020 watershed population to determine the percentage population increase for the TMDL watershed.

Land Cover

The land cover data for the TMDL watershed were obtained from NCTCOG and represent land cover estimates for 2015 (NCTCOG, 2017b). The land cover for the TMDL watershed is shown in Figure II-4. A summary of the land cover data is provided in Table II-3 and indicates that Residential (42.37%) is the dominant land cover in the TMDL watershed.

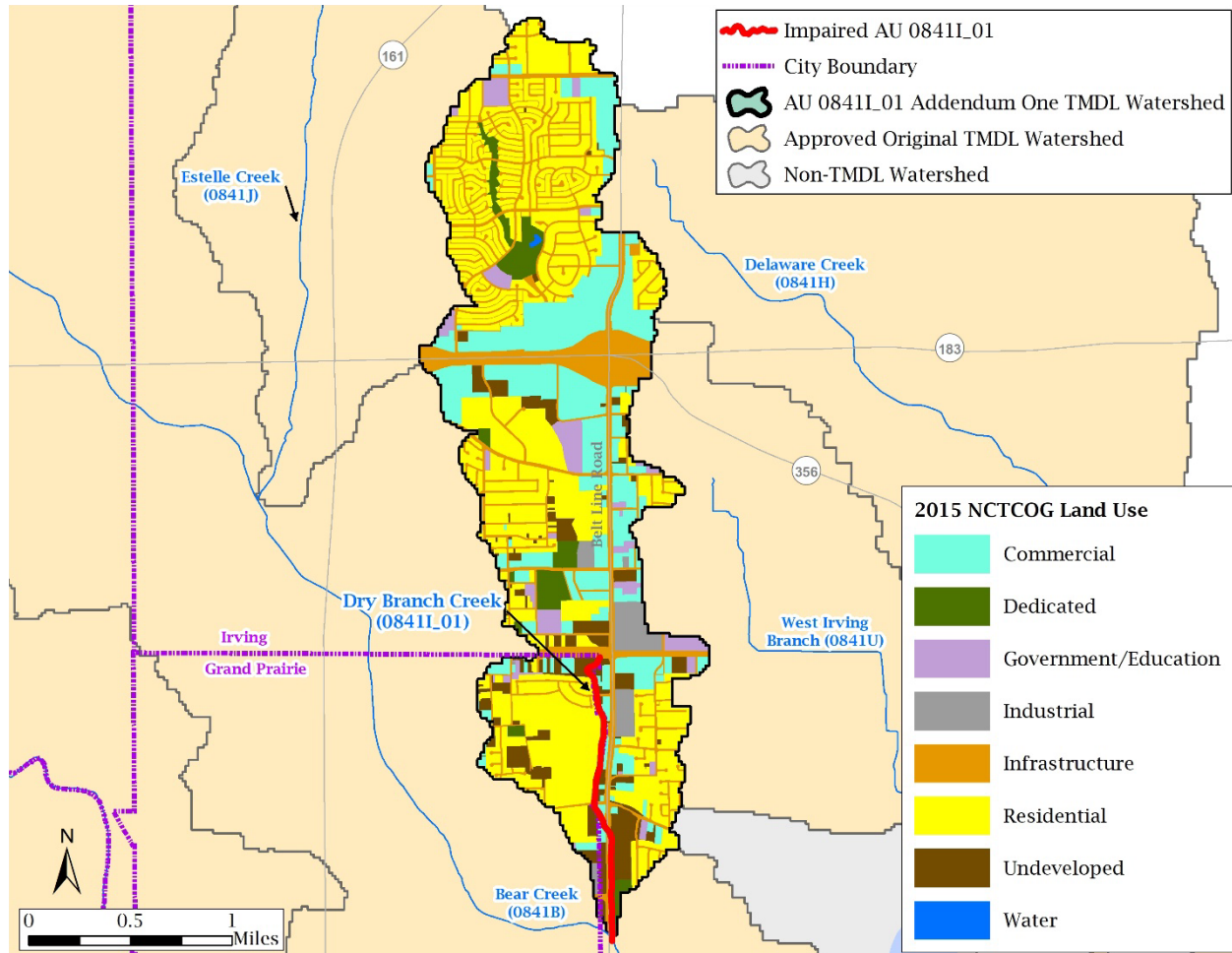


Figure II-4. Land cover map showing classifications

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

2015 Land Cover Class Type	Area (Acres)	% of Total
Residential	919.6	42.37%
Commercial/Industrial	493.6	22.74%
Transit	433.5	19.97%
Group Quarters	5.8	0.27%
Institution	82.6	3.81%
Dedicated	77.4	3.57%
Vacant	156.7	7.21%
Water	1.4	0.06%
Total	2,170.6	100%

Endpoint Identification

The endpoint for the TMDL is to maintain the concentration of *E. coli* below the geometric mean criterion of 126 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 TPDES program. 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 stormwater discharges from municipal separate storm sewer systems (MS4s) and regulated construction activities.

Domestic and Industrial WWTFs

No permitted WWTFs exist in the TMDL watershed. Domestic wastewater is collected by and transported to the Trinity River Authority (TRA) Central Regional Wastewater System, which is outside the TMDL watershed (Figure II-5).

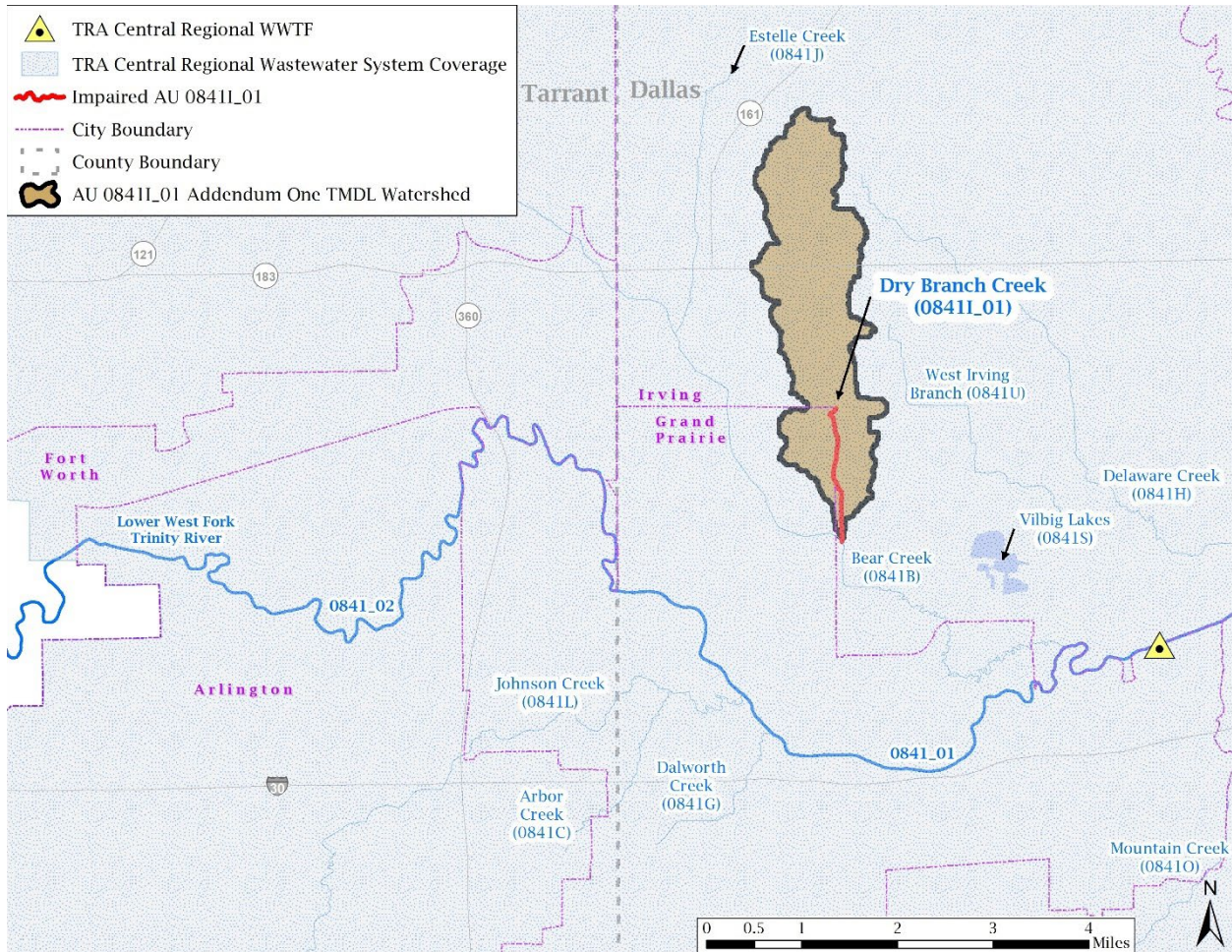


Figure II-5. Coverage area of the TRA Central Regional Wastewater System in the TMDL watershed and surrounding area

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 June 7, 2022, found no active general wastewater permit authorizations of the types described above.

Sanitary Sewer Overflows

A summary of sanitary sewer overflow (SSO) incidents that occurred during a six-year period from 2016 through 2021 in the TMDL watershed was obtained from NCTCOG. The summary data indicated 19 SSO incidents had been reported within the TMDL watershed. The SSOs had a total discharge of 101,187 gallons with a minimum of one gallon and a maximum of 100,000 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 MS4 entities, stormwater discharges associated with regulated industrial facilities, and construction activities.
2. Stormwater runoff not subject to regulation.

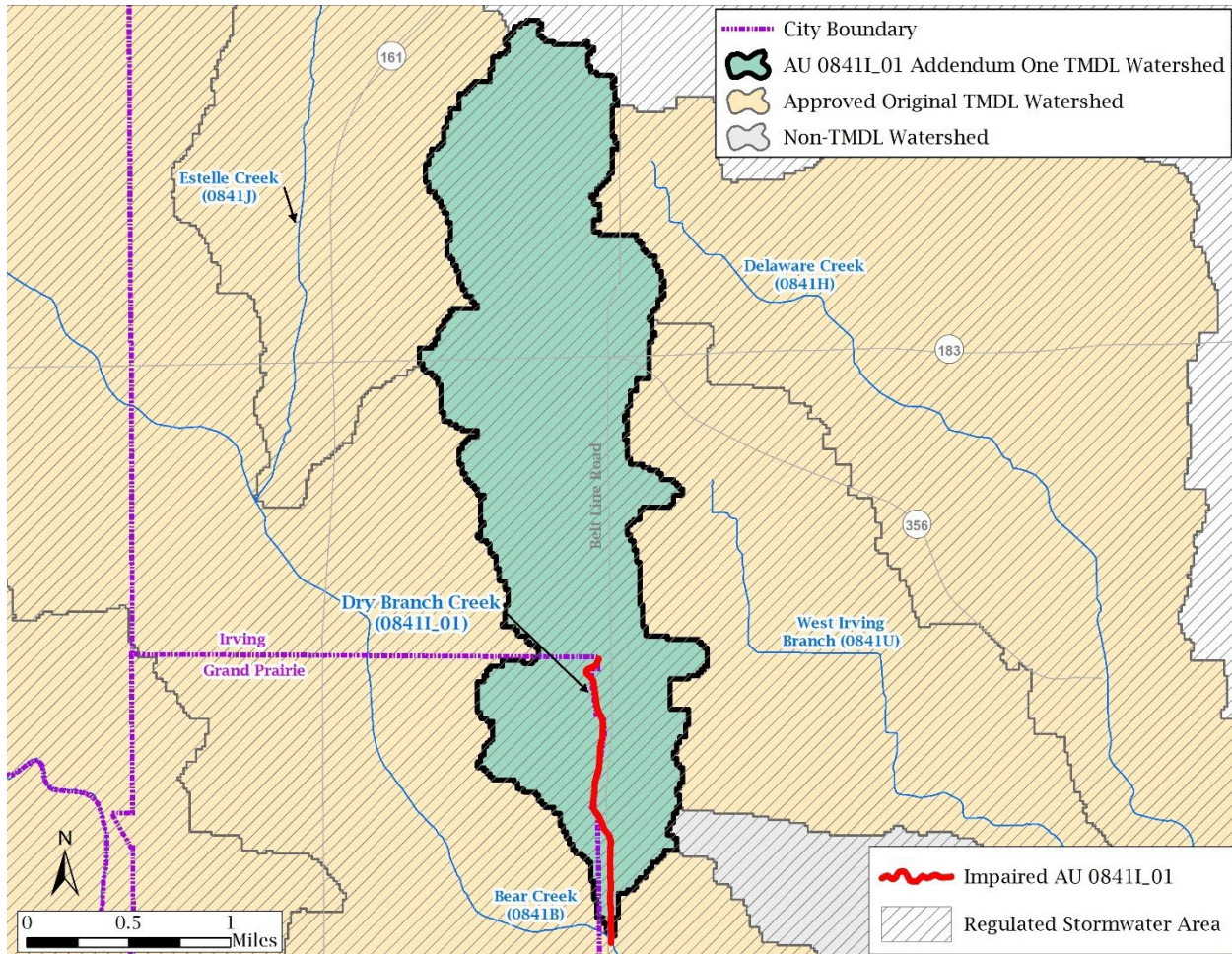
Discharges of stormwater from a Phase II MS4 area, regulated industrial facility, construction area, or other facility involved in certain activities must be covered under the following TCEQ/TPDES general permits:

- 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 coverage as of June 7, 2022 (TCEQ, 2022c) found no MSGP authorizations and two CGP authorizations within the TMDL watershed. There are currently one Phase I permit, one combined Phase I/II permit, and one Phase II MS4 authorization found within the urbanized area of the TMDL watershed (Table II-4). The areas covered by CGP authorizations are not discussed further, since MS4 permits cover 100% of the watershed area. Figure II-6 shows the urbanized area defined by USCB that accounts for MS4 coverage within the TMDL watershed.

Table II-4. TPDES MS4 permits associated with the TMDL watershed

Entity	TPDES Permit	EPA ID	Authorization Type
City of Irving	WQ0004691000	TXS001301	Phase I MS4
Texas Department of Transportation	WQ0005011000	TXS002101	Combined Phase I and II MS4
City of Grand Prairie	General Permit (TXR040000)	TXR040065	Phase II MS4

**Figure II-6. Regulated stormwater area based on Phase I and Phase II MS4 permits as defined by the urbanized area**

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. Agricultural activities are not a source in this highly urbanized watershed.

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 II-5 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 2010 Census household and population data (USCB, 2010) to obtain the ratio of people to households. This ratio was applied to the 2020 Dry Branch Creek population data (USCB, 2021) to estimate the number of households in the TMDL watershed. The actual contribution and significance of bacteria loads from pets reaching Dry Branch Creek is unknown.

Table II-5. Estimated households and pet population

AU	Estimated Households	Estimated Dog Population	Estimated Cat Population
0841I_01	6,722	4,127	3,072

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.

The *E. coli* contribution from feral hogs and wildlife in the TMDL watershed cannot be determined based on existing information. However, due to the urbanized nature of the watershed it is assumed that the contribution is minimal.

On-site Sewage Facilities

Failing OSSFs were not considered a major source of bacteria loading in the TMDL watershed, because the entire watershed area is served by the TRA wastewater collection and treatment system. A review of OSSF information received from NCTCOG indicates that there are no known OSSFs in 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 (Millican and Adams, 2022) provides details about the linkage analysis along with the LDC method and its application.

The *E. coli* event data plotted on the LDC for TCEQ SWQM Station 17173 in Figure II-7 show exceedances of the geometric mean criterion have commonly occurred in the “Very High Flow” and “High Flow” regimes. 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.

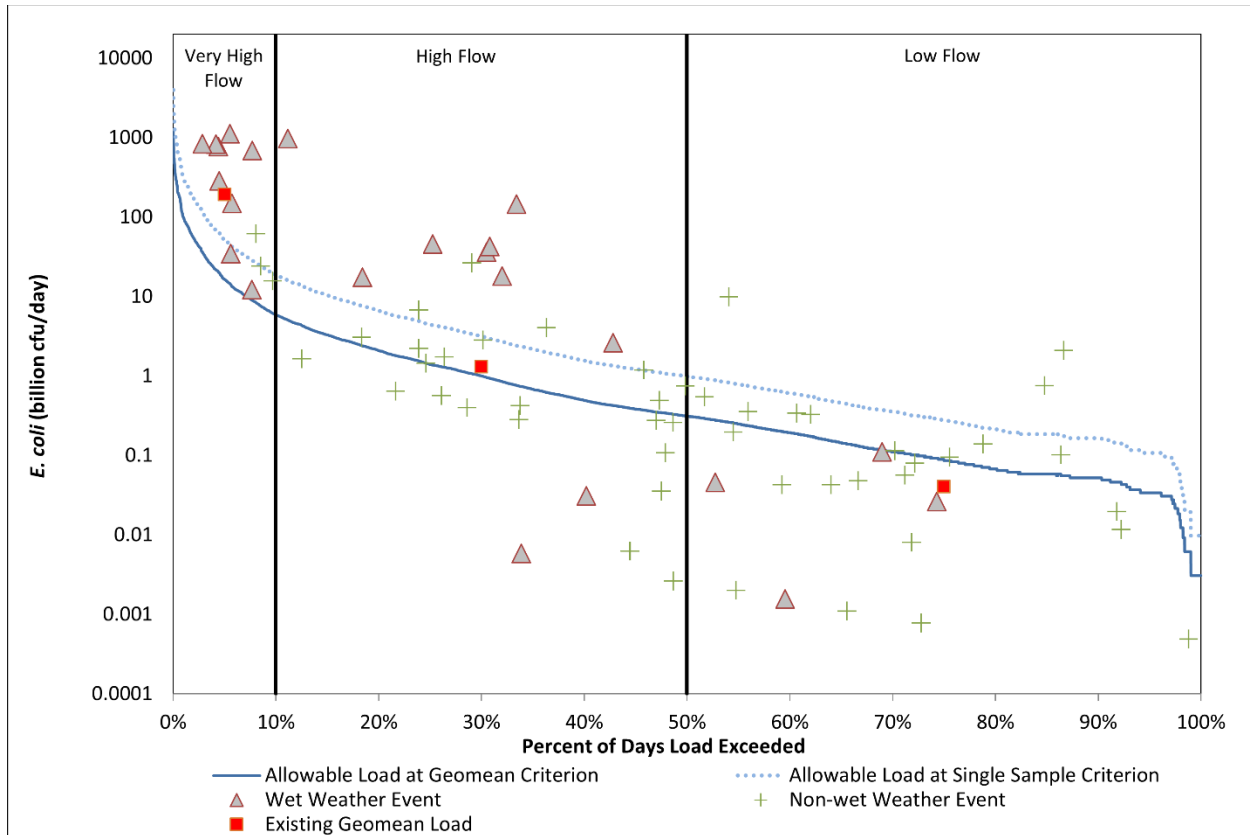


Figure II-7. LDC for TCEQ SWQM Station 17173

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:

$$\text{TMDL} = \text{WLA} + \text{LA} + \text{FG} + \text{MOS}$$

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 Dry Branch Creek was derived using the median flow within the “Very High Flow” regime (or 5% load duration exceedance) of the LDC developed for TCEQ SWQM Station 17173. This station represents the location within Dry Branch Creek where an adequate number of *E. coli* samples was collected.

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 one-half the instream geometric mean criterion. One-half of the water quality criterion (63 cfu/100 mL *E. coli*) is used as the WWTF target to provide instream and downstream load capacity and to be consistent with the original TMDL report. Due to the absence of any permitted dischargers in the TMDL watershed, the WLA_{WWTF} component is zero.

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.

The Dry Branch Creek watershed is covered 100% by MS4 permits. However, even in highly urbanized areas such as the TMDL watershed, there remain some areas of potential direct deposition of bacteria loadings from unregulated sources such as wildlife. To account for these unregulated areas, the stream length of Dry Branch Creek (from the confluence with Bear Creek upstream to Rock Island Road in Irving, Dallas County) and average channel width as calculated based on aerial imagery was used to

compute an area of unregulated stormwater contribution. The percentage of land under the jurisdiction of stormwater permits in the TMDL watershed is 99.8%.

Load Allocation

The 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 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 TMDL watersheds results in the protection of existing uses and conforms to Texas' antidegradation policy. However, due to the absence of any existing WWTFs and the fact that it is highly unlikely that any new WWTFs will be established within the Dry Branch Creek watershed (TRA, 2022), the FG component is zero for this TMDL. In the event of a new point source being added to the watershed, then it will continue to conform to Texas' antidegradation policy. The three-tiered antidegradation policy in the Texas Surface Water Quality Standards prohibits an increase in loading that would cause or contribute to degradation of an existing use. The antidegradation policy applies to point source pollutant discharges. In general, antidegradation procedures establish a process for reviewing individual proposed actions to determine if the activity will degrade water quality.

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 II-6 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, "Very High Flow" regime) from the LDC developed for the TCEQ SWQM Station 17173. Allocations are based on the current geometric mean criterion for *E. coli* of 126 cfu/100 mL for each component of the TMDL (with the exception of the WLA_{WWTF} and FG terms, which would be based on one-half the criterion if they applied).

Table II-6. TMDL allocation summaryAll loads expressed as billion cfu/day *E. coli*

Water Body	AU	TMDL	MOS	WLA _{WWTF}	WLA _{SW}	LA	FG
Dry Branch Creek	0841I_01	16.545	0.827	0	15.694	0.024	0

The final TMDL allocations (Table II-7) needed to comply with federal requirements include the FG component within the WLA_{WWTF} (40 CFR Section 103.7).

Table II-7. Final TMDL allocationAll loads expressed as billion cfu/day *E. coli*

Water Body	AU	TMDL	MOS	WLA _{WWTF}	WLA _{SW}	LA
Dry Branch Creek	0841I_01	16.545	0.827	0	15.694	0.024

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 21 years (2001 through 2021) 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 a significant difference ($\alpha=0.05$) in indicator bacteria between cool and warm weather seasons for Dry Branch Creek ($p=0.04$), with the warm season having higher *E. coli* concentrations. Seasonal variation was also addressed by using all available flow and *E. coli* 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 (Millican and Adams, 2022) was published on the TCEQ website on January 5, 2023. Project staff presented information about this addendum at the annual meeting of the Greater Trinity River Bacteria TMDL Implementation Plan Coordination Committee hosted by NCTCOG

(held online) on June 15, 2022. The public had an opportunity to comment on this addendum during the public comment period (Nov. 10 through Dec. 14, 2023) 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](#).^d Notice of the comment period, along with the document, was also posted on the [WQMP Updates webpage](#).^e TCEQ accepted public comments on the original TMDL report from May 24 through June 24, 2013. One comment was submitted, however, it did not refer 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 watershed for the Lower West Fork Trinity River. That TMDL watershed, including Dry Branch Creek, is within the area covered by the implementation plan (I-Plan) developed by stakeholders, which was approved by the commission on December 11, 2013. 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.

^d www.tceq.texas.gov/waterquality/tmdl/tmdlnews.html

^e www.tceq.texas.gov/permitting/wqmp/WQmanagement_updates.html

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Appendix III. Updates to Seven TMDLs for Indicator Bacteria in Lake Houston, East Fork San Jacinto River, West Fork San Jacinto River, and Crystal Creek Watersheds

Segments 1002, 1003, 1004, and 1004D

This appendix provides updates to TMDLs previously submitted through the state's WQMP for: Lake Houston, East Fork San Jacinto River, West Fork San Jacinto River, and Crystal Creek Watersheds.

The report, *Seven Total Maximum Daily Loads for Indicator Bacteria in Lake Houston, East Fork San Jacinto River, West Fork San Jacinto River, and Crystal Creek Watersheds For Segments 1002, 1003, 1004, and 1004D*, was adopted by TCEQ on 08/24/16 and approved by EPA on 10/07/16. Upon EPA approval, the TMDLs became part of the state's WQMP.

The Texas WQMP has since been updated 15 times prior to this update for this TMDL. The previous updates have revised the list of individual WLAs in the original TMDL document. Additionally, TCEQ submitted an addendum to the original TMDL in the October 2018 WQMP update. This addendum added one new AU to the original TMDL project. A second addendum to the original TMDL was added in the January 2023 WQMP update. This addendum added one new AU to the original TMDL project.

The purpose of this update is to make the following changes to the TMDL (presented in Table III-1):

- Add two new permits
- Increase flow to an existing permit

The changes reflected in this update resulted in the shifting of allocations between the sum of the individual WLAs and the allowance for FG in three AUs. This was originally presented in Table 17 in the original TMDL document. The three affected AUs in this update are included here as Table III-2.

In Table 18 of the original TMDL, the WLAs for permitted facilities are the sum of the individual WLAs and the allowance for FG within each AU. These overall numbers for the three AUs did not change, and this results in no changes to the overall TMDL allocations.

Table III-1 - Changes to individual WLAs for the TMDL watersheds

Updates Table 13, p. 54-55 in the original TMDL document.

The WLA is expressed in billion MPN/day *E. coli*.

State Permit Number	Outfall	EPA Permit Number	AU	Permittee Name	Flow (MGD)	WLA	TMDL Comments
16341-001	001	TX0144525	1004_01	MC GULF COAST LP	0.26	0.6201	New permit
13760-001	001	TX0089672	1004_01	MONTGOMERY COUNTY MUD 56 WWTF	0.34	0.8108	Increasing flow for existing permit
16332-001	001	TX0144436	1015_01	CROWN OAKS DR, LLC	0.05	0.1192	New Permit

Table III-2 - TMDL summary calculations for three AUs in the TMDL watersheds

Updates Table 17, p. 59 in the original TMDL document.

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

AU	Segment Name	TMDL	MOS	WLA WWTF	WLA SW	LA AU	LA TRIB	LA RES	LA TOTAL	FG
1002_06	Lake Houston	6,197	106.57	107.38	288.17	1,535.70	3,106.90	958.70	5,601.30	93.58
1004_01	West Fork San Jacinto River	2,779	88.77	104.10	196.81	1,294.21	44.86	958.7	2,297.77	91.55
1004_02	West Fork San Jacinto River	1,141	9.12	48.32	4.04	75.26	0	958.7	1,033.96	45.56

Appendix IV. Updates to Eight TMDLs for Indicator Bacteria in Greens Bayou Above Tidal and Tributaries

Segments 1016, 1016A, 1016B, 1016C, and 1016D

This appendix provides updates to TMDLs previously submitted through the state's WQMP for: Greens Bayou Above Tidal and Tributaries.

The report, *Eight Total Maximum Daily Loads for Indicator Bacteria in Greens Bayou Above Tidal and Tributaries: Segments 1016, 1016A, 1016B, 1016C, and 1016D*, was adopted by TCEQ on 06/02/10 and approved by EPA on 08/12/10. Upon EPA approval, the TMDLs became part of the state's WQMP.

The Texas WQMP has since been updated 14 times prior to this update for this TMDL. The previous updates have revised the list of individual WLAs in the original TMDL document.

The purpose of this update is to make the following change to the TMDL (presented in Table IV-1):

- Add one new permit
- Remove two expired permits

The changes reflected in this update resulted in the shifting of allocations between the sum of the individual WLAs and the allowance for FG in two AUs. This was originally presented in Table 17 in the original TMDL document. The two affected AUs in this update are included here as Table IV-2.

In Table 18 of the original TMDL, the WLAs for permitted facilities are the sum of the individual WLAs and the allowance for FG within each AU. These overall numbers did not change; Table 18 of the original TMDL remains the same.

Table IV-1 - Changes to individual WLAs for the TMDL watersheds

Updates Table 15, pp. 39-42 in the original TMDL document.

The WLA is expressed in billion MPN/day *E. coli*.

State Permit Number	Outfall	EPA Permit Number	AU	Permittee Name	Flow (MGD)	WLA	TMDL Comments
12484-001	001	TX0089281	1016_02	BORING SPECIALTIES	N/A	N/A	Expired permit with name change
16359-001	001	TX0144657	1016_02	PR-PARK RIDGE APARTMENTS LLC	0.0061	0.015	New permit
15626-001	001	TX0138070	1016_03	SOUTH CENTRAL WATER COMPANY	N/A	N/A	Expired permit

Table IV-2 - TMDL summary calculations for two AUs in the TMDL watersheds

Updates Table 17, p. 46 in the original TMDL document.

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

AU	Segment Name	TMDL	WLA WWTF	WLA SW	LA	MOS	FG
1016_02	Greens Bayou Above Tidal	1,020	121.0	789	0	51.2	58.8
1016_03	Greens Bayou Above Tidal	1,780	218.8	1,114	167	89.0	191.2

Appendix V. Updates to Fifteen TMDLs for Indicator Bacteria in Watersheds Upstream of Lake Houston

Segments 1004E, 1008, 1008H, 1009, 1009C, 1009D, 1009E, 1010, and 1011

This appendix provides updates to TMDLs previously submitted through the state's WQMP for: Watersheds Upstream of Lake Houston.

The report, *Fifteen Total Maximum Daily Loads for Indicator Bacteria in Watersheds Upstream of Lake Houston for Segment Numbers 1004E, 1008, 1008H, 1009, 1009C, 1009D, 1009E, 1010, and 1011*, was adopted by TCEQ on 04/06/11 and approved by EPA on 06/29/11. Upon EPA approval, the TMDLs became part of the state's WQMP.

The Texas WQMP has since been updated 43 times prior to this update for this TMDL. The previous updates have revised the list of individual WLAs in the original TMDL document. Additionally, TCEQ submitted four addenda to the original TMDL in the October 2013, October 2019, October 2020, and April 2022 WQMP updates. These addenda added 10 new AUs to the original TMDL project.

The purpose of this update is to make the following changes to the TMDL (presented in Table V-1):

- Add seven new permits
- Reduce the flow for one existing permit

The changes reflected in this update resulted in the shifting of allocations between the sum of the individual WLAs and the allowance for FG in eight Aus. This was originally presented in Table 18 in the original TMDL document. The eight affected Aus in this update are included here as Table V-2.

For Aus 1008_02, 1009_02, and 1009E_01, the existing FG allocations were insufficient to cover the increased flow to the Aus for this update. To account for this, the total amount exceeded beyond the original FG allocation was added to the total TMDL allocation for each AU. These changes in flow resulted in a change to the overall TMDL allocation for all three Aus, which have been updated in Tables V-2 and V-3. The overall numbers for the other Aus did not change and did not result in a change to the overall TMDL allocations.

Table V-1 - Changes to individual WLAs for the TMDL watershed

Updates Table 16, p. 49-56 in the original TMDL document.

The WLA is expressed in billion MPN/day *E. coli*.

State Permit Number	Outfall	EPA Permit Number	AU	Permittee Name	Flow (MGD)	WLA	TMDL Comments
16381-001	001	TX0144860	1008_02	HARRIS COUNTY MUD NO. 588	0.3	0.715	New permit
16358-001	001	TX0144649	1008_02	NORTH CATCH 1488 LLC	0.225	0.537	New permit
16347-001	001	TX0144550	1008_02	JOSEPH RD WWTP LLC	0.2	0.477	New permit
16382-001	001	TX0144878	1008_02	Greenwood Land Holdings, LLC	0.24	0.572	New permit
16371-001	001	TX0144746	1008H_01	WILLOW INVESTMENT PARTNERS, LP	0.05	0.119	New permit
16380-001	001	TX0144851	1009_02	JDI SPRING CYPRESS SPE, LLC	0.05	0.119	New permit
14030-001	001	TX0075221	1009_02	NORTHWEST HARRIS CO MUD #9	0.95	2.266	Reduced flow for existing permit
16334-001	001	TX0144444	1009E_01	HARRIS COUNTY MUD NO. 531	0.1	0.238	New permit

Table V-2 - TMDL summary calculations for eight AUs in the TMDL watershed

Updates Table 18, p. 61 in the original TMDL document.

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

AU	Sampling Location	Segment Name	TMDL	WLA WWTF	WLA sw	LA	MOS	FG
1008_02	11314	Spring Creek	300.85	20.05	71.9	194.5	14.4	0.00
1008_03	11313	Spring Creek	1420	142.33	322	869	70.9	15.77
1008_04	11312	Spring Creek	1510	178.00	334	902	75.7	20.30
1008H_01	11185	Willow Creek	166	26.08	51.1	67.8	8.28	12.74
1009_02	11331	Cypress Creek	614.11	117.31	196	270	30.8	0.00
1009_03	11328	Cypress Creek	1340	201.09	415	574	67.0	82.91
1009_04	11324	Cypress Creek	1550	240.42	469	648	77.4	115.18

AU	Sampling Location	Segment Name	TMDL	WLA _{WWTF}	WLA _{SW}	LA	MOS	FG
1009E_01	14159	Little Cypress Creek	92.53	23.41	16.14	48.42	4.56	0.00

Table V-3 - TMDL final calculations

Updates Table 19, p. 62 in the original TMDL document.

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

AU	TMDL	WLA _{WWTF}	WLA _{SW}	LA _{TOTAL}	MOS
1008_02	300.85	20.05	71.9	194.5	14.4
1009_02	614.11	117.31	196	270	30.8
1009E_01	92.53	23.41	16.14	48.42	4.56

In addition, Table V-4 below provides an update to Table 9 found in the October 2019 addendum to this TMDL project (*Addendum Two to Fifteen Total Maximum Daily Loads for Indicator Bacteria in Watersheds Upstream of Lake Houston: Two Total Maximum Daily Loads for Indicator Bacteria in Brushy Creek and Spring Branch For Aus 1008J_01 and 1010C_01*). Two of the permits discussed earlier in this update also affect one AU in this addendum.

Table V-5 below provides updates to Table 10 found in the October 2019 addendum to this TMDL project. The addendum added two Aus that were not included in the original TMDL. The AU affected here (1008J_01) was included as an upstream loading to AU 1008_02 in the original TMDL. Two of the permits (16347-001/ TX0144550 and 16382-001/ TX0144878) affect the loading of AU 1008J_01 as well as the original TMDL AU 1008_02.

For AU 1008J_01, the existing FG allocation was insufficient to cover the increased flow to the AU for this update. To account for this, the total amount exceeded beyond the original FG allocation was added to the total TMDL allocation. This resulted in a change to the overall TMDL allocation for the one AU, which has been updated in Tables V-5 and V-6.

Table V-4 - Changes to individual WLAs in the Brushy Creek watershed

Updates Table 9, p. 17 in the TMDL addendum document.

The WLA is expressed in billion cfu/day *E. coli*.

State Permit Number	Outfall	EPA Permit Number	AU	Permittee Name	Flow (MGD)	WLA	TMDL Comments
16347-001	001	TX0144550	1008J_01	JOSEPH RD WWTP LLC	0.2	0.477	New permit
16382-001	001	TX0144878	1008J_01	Greenwood Land Holdings, LLC	0.24	0.572	New permit

Table V-5 - TMDL summary calculations for one AU in the Brushy Creek watershed

Updates Table 10, p. 19 in the TMDL addendum document.

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

Water Body	AU	TMDL	WLA WWTF	WLA SW	LA	FG	MOS
Brushy Creek	1008J_01	202.139	1.592	8.059	182.457	0.000	10.031

Table V-6 – TMDL addendum final calculations

Updates Table 11, p. 19 in the TMDL addendum document.

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

Water Body	AU	TMDL	WLA WWTF	WLA SW	LA _{TOTAL}	MOS
Brushy Creek	1008J_01	202.139	1.592	8.059	182.457	10.031

Finally, Table V-7 below provides an update to Table 8 found in the October 2020 addendum to this TMDL project (*Addendum Three to Fifteen Total Maximum Daily Loads for Indicator Bacteria in Watersheds Upstream of Lake Houston: One Total Maximum Daily Load for Indicator Bacteria in Walnut Creek For AU 1008I_01*). One of the permits discussed earlier in this update also affects one AU in this addendum.

Table V-8 below provides updates to Table 9 found in the October 2020 addendum to this TMDL project. The addendum added one AU that was not included in the original TMDL. The AU affected here (1008I_01) was included as an upstream loading to AU 1008_02 in the original TMDL. One of the permits (16358-001/ TX0144649) affects the loading of AU 1008I_01 as well as the original TMDL AU 1008_02.

In Table 9 of the October 2020 TMDL addendum, the WLAs for permitted facilities are the sum of the individual WLAs and the allowance for FG within the single affected AU.

Therefore, these overall numbers did not change, and Table 10 of the TMDL addendum remains the same.

Table V-7 - Changes to individual WLAs in the Walnut Creek watershed

Updates Table 8, p. 18 in the TMDL addendum document.

The WLA is expressed in billion cfu/day *E. coli*.

State Permit Number	Outfall	EPA Permit Number	AU	Permittee Name	Flow (MGD)	WLA	TMDL Comments
16358-001	001	TX0144649	1008I_01	NORTH CATCH 1488 LLC	0.225	0.537	New permit

Table V-8 - TMDL summary calculations for one AU in the Walnut Creek watershed

Updates Table 9, p. 19 in the TMDL addendum document.

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

Water Body	AU	TMDL	WLA WWTF	WLA SW	LA	FG	MOS
Walnut Creek	1008I_01	335.982	8.871	40.845	254.706	14.761	16.799

Appendix VI. Update to Three Total Maximum Daily Loads for Chloride, Sulfate, and Total Dissolved Solids in Petronila Creek Above Tidal Segment 2204

This appendix provides an update to TMDLs previously submitted through the state's WQMP for: Petronila Creek Above Tidal.

The report, *Three Total Maximum Daily Loads for Chloride, Sulfate, and Total Dissolved Solids in Petronila Creek Above Tidal for Segment Number 2204*, was adopted by TCEQ on 01/10/07 and approved by EPA on 03/14/07. Upon EPA approval, the TMDL became part of the state's WQMP.

The Texas WQMP has since been updated six times prior to this update for this TMDL. The previous updates have revised the list of individual WLAs in the original TMDL document.

The purpose of this update is to make the following change to the TMDL (presented in Table VI-1):

- Update one existing permit with decreased flow
- Remove two expired permits

The addition of this new facility and removal of the two expired permits changes the overall TMDL equations for chloride, sulfate, and total dissolved solids (TDS), given in Tables 11, 12, and 13, respectively, in the original TMDL document. Please note that the total wasteload allocations (WLAs) for sulfate and TDS were presented erroneously in the original TMDL document (lbs/day were given instead of lbs/year). The total TMDL equations have been updated in Table VI-2.

Table VI-1 - Changes to individual WLAs for the Petronila Creek Above Tidal watershed

Updates Table 7, p. 28 in the original TMDL document.

The WLAs are expressed in lb/day.

State Permit Number	Outfall	EPA Permit Number	Permittee Name	Flow (MGD)	Permit Implementation	WLA	TMDL Comments
05430-000	001	TX0144541	TESLA, INC.	0.2311	Chloride Limit	2,748	Decreased flow for existing permit
					Sulfate Limit	916	
					Total Dissolved Solids Limit	7,329	
011583-002	001	TX0137197	NUECES COUNTY WCID NO. 5	N/A	Chloride Limit	N/A	Expired permit
					Sulfate Limit	N/A	
					Total Dissolved Solids Limit	N/A	
014981-002	001	TX0140562	KB FOUNDATION OF TX	N/A	Chloride Limit	N/A	Expired permit
					Sulfate Limit	N/A	
					Total Dissolved Solids Limit	N/A	

Table VI-2 – TMDL final calculations

Updates Tables 11-13, p. 32-33 in the original TMDL document.

All loads are expressed in lb/year.

	TMDL	WLA	LA	MOS
Chloride	4.55E+07	3.69E+06	3.96E+07	2.28E+06
Sulfate	2.08E+07	1.23E+06	1.85E+07	1.04E+06
TDS	9.90E+07	9.83E+06	8.42E+07	4.95E+06

Appendix VII. Updates to Six TMDLs for Indicator Bacteria in Waters of the Upper Gulf Coast

Segments 2421, 2422, 2423, 2424, 2432, and 2439

This appendix provides updates to TMDLs previously submitted through the state's WQMP for: Waters of the Upper Gulf Coast.

The report, *Six Total Maximum Daily Loads for Bacteria in Waters of the Upper Gulf Coast: Segments 2421, 2422, 2423, 2424, 2432, and 2439*, was adopted by TCEQ on 08/20/08 and approved by EPA on 02/04/09. Upon EPA approval, the TMDLs became part of the state's WQMP.

The Texas WQMP has since been updated 11 times prior to this update for this TMDL. The previous updates have revised the list of individual WLAs in the original TMDL document. Additionally, two addenda to the original TMDL were submitted through the January 2012 and April 2012 WQMP updates. These addenda added four new AUs to the original TMDL project.

The purpose of this update is to make the following changes to the TMDL (presented in Table VII-1):

- Add one new permit
- Remove an existing permit

Note that this is a concentration-based TMDL, and therefore there are no final TMDL equations to be affected by these changes.

Table VII-1 - Daily Loads for Wastewater Treatment Facilities based on Concentration Allocations

Updates table in Appendix A, p. A-1 in the original TMDL document.

State Permit Number	Outfall	EPA Permit Number	Segment Number	Permittee Name	Flow (MGD)	Waste Load Allocation (WLA) Fecal Coliform (org/day)*	Waste Load Allocation (WLA) <i>E. coli</i> (org/day) *	Waste Load Allocation (WLA) Enterococcus (org/day) *	Comments
10779-001	001	TX0027260	2421	CITY OF MORGAN'S POINT	0.45	3,406,870,602	2,146,328,479	596,202,355	New permit
14980-001	001	TX0132748	2421	GRANITE OCEANWAY, LLC	N/A	N/A	N/A	N/A	Expired permit with name change

*Concentrations limits will be based on the applicable indicator bacteria criterion geometric means (Fecal coliform or *E. coli* or Enterococcus).