Approved February 9, 2011

Implementation Plan for One Total Maximum Daily Load for Bacteria in Gilleland Creek

Segment 1428C

Water Quality Planning Division, Office of Water

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Distributed by the
Total Maximum Daily Load Team
Texas Commission on Environmental Quality
MC-203
P.O. Box 13087
Austin, Texas 78711-3087
E-mail: tmdl@tceq.texas.gov

TMDL implementation plans are also available on the TCEQ website at:
<www.tceq.texas.gov/implementation/water/tmdl/>

This implementation plan is based in large part on the submissions
from the six stakeholder work groups organized by the Lower Colorado River Authority.
The reports of the work groups can be found on the TCEQ website at:
<www.tceq.texas.gov/goto/tmdl>.

The preparation of this report was financed in part through grants from
the U.S. Environmental Protection Agency.

Contents

Executive Summary 1
Management Measures (Voluntary Activities) 1
Control Action (Regulatory Activities) 1
Introduction 2
Summary of the TMDL 3
Watershed Overview 3
Pollutant Sources and Loads 5
Waste Load Allocation (WLA) 5
Implementation Strategy 7
Adaptive Implementation 8
Activities and Milestones 8
Management Measures and Control Action 8
Management Measure 1.0 9
Management Measure 2.0 13
Management Measure 3.0 23
Management Measure 4.0 26
Management Measure 5.0 31
Management Measure 6.0 34
Control Action 1.0 37
Sustainability 40
Water Quality Indicators 40
Implementation Milestones 41
Communication Strategy 42
References 43

Figures

Figure 1. Gilleland Creek TMDL Watershed 4

Tables

Table 1. Summary of Criteria and 2004 Assessment Data 3
Table 2. Maximum Permitted Flow and WLA for Each WWTF 6
Table 3. On-Site Sewage Facilities Management Measure Summary 12
Table 4. Natural Resource Management Measure Summary 22
Table 5. Storm Water Management Measure Summary 25
Table 6. Education and Outreach (Pet Waste) Management Measure Summary 30
Table 7. Ordinance and Planning Management Measure Summary 33
Table 8. Wastewater Treatment Facility Management Measures Summary 36
Table 9. Wastewater Treatment Facility Permit 2009 Revisions 37
Table 10. Wastewater Treatment Facilities Control Action Summary 39

Table A-1. On-Site Sewage Facilities Measures — Implementation Schedule and Tasks.....A-2
Table A-2. Natural Resource Management Measures — Implementation Schedules and Tasks.....A-4
Table A-3. Storm Water Management Measures — Implementation Schedules and Tasks.....A-10
Table A-4. Education and Outreach (Pet Waste) Management Measures — Implementation Schedules and Tasks.....A-11
Table A-5. Ordinance and Planning Management Measures — Implementation Schedules and Tasks.....A-12
Table A-6. Wastewater Treatment Facility Management Measures — Implementation Schedules and Tasks.....A-13
Table A-7. Wastewater Treatment Facilities Control Actions — Implementation Schedules and Tasks.....A-15
Table C-1. Summary of Five-Year Load Reductions with Moderate Flow.....C-5

List of Acronyms

AU	assessment unit
AWEP	Agricultural Water Enhancement Program
BMP	best management practice
cfu	colony-forming units
CIG	Conservation Innovation Grants
COA	City of Austin
CRP	Conservation Reserve Program
CRWN	Colorado River Watch Network
CRWR	Center for Research in Water Resources at the University of Texas at Austin
CSP	Conservation Stewardship Program
DMR	Discharge Monitoring Report
E. coli	Escherichia coli
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ETJ	extraterritorial jurisdiction
ft	feet
FEMA	Federal Emergency Management Agency
FOTG	USDA NCRS Field Office Technical Guide
FRPP	Farm and Ranch Lands Protection Program
GIS	geographic information system
GRP	Grassland Reserve Program
I-Plan	implementation plan
LA	load allocation
LCRA	Lower Colorado River Authority
LDC	load duration curve
LIP	Landowner Incentive Program
mL	milliliter
MGD	million gallons per day
MOS	margin of safety
MS4	municipal separate storm sewer system
NELAC	National Environmental Laboratory Accreditation Conference
NPDES	National Pollutant Discharge Elimination System
NRCS	USDA Natural Resources Conservation Service
OSSF	onsite sewage facility
RC&D	Resource Conservation and Development Areas
SEP	Supplemental Environmental Project
SSO	sanitary sewer overflow
SWMP	storm water management plan
TAC	Texas Administrative Code
TDA	Texas Department of Agriculture
TCEQ	Texas Commission on Environmental Quality
TMDL	total maximum daily load
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TPL	Trust for Public Land

TWS	Texas Wildlife Services
TSSWCB	Texas State Soil and Water Conservation Board
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
WRP	Wetlands Reserve Program
WHIP	Wildlife Habitat Incentives Program
WLA	waste load allocation
WMP	wildlife management plan
WQMP	Water Quality Management Plan
WWTF	wastewater treatment facility

Implementation Plan for One TMDL for Bacteria in Gilleland Creek

Executive Summary

One Total Maximum Daily Load (TMDL) for Bacteria in Gilleland Creek (Segment 1428C) was adopted by the Texas Commission on Environmental Quality (TCEQ) on August 8, 2007 and approved by the U.S. Environmental Protection Agency (EPA) on April 21, 2009. The second part of the TMDL process is an Implementation Plan (I-Plan) which describes the strategy and activities the TCEQ and watershed partners will carry out to improve water quality in the affected watershed.

This I-Plan is based on the TMDL and its subsequent revisions, which are documented in updates to the state's Water Quality Management Plan (WQMP). The TMDL identified potential regulated and unregulated sources of Escherichia Coli (E. coli). Regulated dischargers in the Gilleland Creek watershed include domestic wastewater treatment facilities (WWTFs), industrial facilities, municipal solid waste facilities, and regulated storm water dischargers. Potential unregulated E.coli sources identified in the TMDL include malfunctioning on-site sewage facilities (OSSFs), agriculture practices, development, and pet, wildlife, and unmanaged animal waste.

The goal of this I-Plan is the reduction of bacteria concentrations in Gilleland Creek to levels that meet the contact recreation criterion defined in the Texas Surface Water Quality Standards. This plan documents six stakeholder developed management measures and one control action that will be used to reduce bacteria contributions.

Management Measures (Voluntary Activities)

1) *Identify, prioritize, inspect, and bring into compliance malfunctioning OSSFs.*
2) *Restore and preserve riparian zones to protect water quality.*
3) *Determine the effectiveness of retrofitting existing storm-water detention basins to also perform as water quality facilities to reduce bacteria concentrations.*
4) *Partners coordinate to develop a general campaign to raise public awareness of unregulated contributions of bacteria pollution, specifically pet waste.*
5) *Develop and adopt equivalent water quality ordinances between government jurisdictions.*
6) *Conduct annual visual inspection of wastewater collection systems within 100 feet (ft) from the centerline of Gilleland Creek and its tributaries.*

Control Action (Regulatory Activities)

7) *Monitor and report effluent E. coli concentrations from WWTFs.*

This I-Plan identifies responsible parties, technical and financial needs, monitoring and outreach efforts, and a schedule of activities for each management measure and control action. It describes the process that the TCEQ and stakeholders will use to assess progress

and adjust the plan periodically. The TCEQ will report results and evaluations from implementation tracking to stakeholders as needed.

Introduction

To keep Texas' commitment to restore and maintain water quality in impaired rivers, lakes, and bays, the TCEQ works with stakeholders to develop an I-Plan for each adopted TMDL. A TMDL is a technical analysis that:

- determines the amount of a particular pollutant that a water body can receive and still meet applicable water quality standards, and
- sets limits on categories of sources that will result in achieving standards.

This I-Plan is designed to guide activities that will achieve the water quality goals for Gilleland Creek as defined in the adopted TMDL. This I-Plan is a flexible tool that governmental and nongovernmental organizations involved in implementation use to guide their activities to reduce bacteria loads. The participating partners may accomplish the activities described in this I-Plan through rule, order, guidance, or other appropriate formal or informal action.

This I-Plan contains the following components:

1) a description of control actions and management measures[1] that will be implemented to achieve the water quality target.
2) a schedule for implementing activities (Appendix A).
3) the legal authority under which the participating agencies may require implementation of the control actions.
4) a follow-up tracking and monitoring plan to determine the effectiveness of the control actions and management measures undertaken.
5) identification of measurable outcomes and other considerations the TCEQ and stakeholders will use to determine whether the I-Plan has been properly executed, water quality standards are being achieved, or the plan needs to be modified.
6) identification of the communication strategies the TCEQ will use to disseminate information to stakeholders.
7) A review strategy that stakeholders will use to periodically review and revise the plan to ensure there is continued progress in improving water quality.

This I-Plan also includes causes and sources of the bacterial impairment, management measure descriptions, estimated potential load reductions, technical and financial assistance needed, educational components for each measure, schedule of implementation, measurable milestones, indicators to measure progress, monitoring components, and responsible. Consequently, projects developed to implement unregulated (nonpoint) source elements of this plan that meet the grant program conditions may be eligible for funding under the EPA's Section 319(h) grant program.

[1] Control actions refer to regulated sources reduction strategies, generally TPDES permits. Management measures refer to strategies for reducing unregulated pollutants, generally through voluntary best management practices (BMPs).

Summary of the TMDL

This section summarizes sections of the Gilleland Creek TMDL. Additional background information including the problem definition, endpoint identification, source analysis, linkages between sources and receiving waters, and pollutant load allocations can be found in the Gilleland Creek TMDL (TCEQ 2007).

Watershed Overview

Gilleland Creek is approximately 31 miles long, with a watershed area of 76 square miles in eastern Travis County (Figure 1). The creek originates northwest of the city of Pflugerville and flows southeasterly where it joins the Colorado River Below Town Lake[2] (Segment 1428) near the city of Webberville. Elm Creek, Decker Creek, and Harris Branch are the largest tributaries of Gilleland Creek.

Gilleland Creek is identified as Segment 1428C, an unclassified freshwater stream that was once perennial, or intermittent with perennial pools, depending on the area. The creek is now perennial due to effluent from facilities permitted to discharge treated wastewater into the creek. Land use in the watershed is undergoing a rapid transition from primarily agricultural to more urban. The watershed includes several different types of land cover including agriculture, commercial, residential, and heavy urban use. The majority of the soil types in the watershed are clays. The total population for the Gilleland Creek watershed is approximately 44,139 people, with approximately 14,124 households (U.S. Census Bureau 2000).

This I-Plan is designed for the entire Gilleland Creek watershed including all the assessment units (AUs) identified in Figure 1. Gilleland Creek (AU1) was first identified as not supporting the contact recreation criteria in the *2004 Texas Water Quality Inventory and 303(d) List*. Table 1 provides the water quality criteria and a summary of the 2004 assessment data. The *2008 Texas Water Quality Inventory and 303(d) List* identified adequate data to asses AU1 as non-supporting with a geometric mean value of 166.35 cfu/100mL. There was a limited data set for the remaining AUs; they were listed, therefore, as a concern for near non-attainment because of geometric mean values above the water quality criteria.

Table 1. Summary of Criteria and 2004 Assessment Data

(Data collected March 1, 1998-March 28, 2003)

	Water Quality Criteria		Assessed Concentration, 2004	
	Geometric Mean (cfu/100mL)	Individual Sample (cfu/100mL)	Geometric Mean (cfu/100mL)	Exceedance of Single Sample (%)
E. coli	126	394*	240	31%
Fecal coliform	200	400	365	36%

[2] The official name of Segment 1428 is the Colorado River Below Town Lake. Town Lake was renamed Lady Bird Lake by the Austin City Council in 2007, but is still referred to as Town Lake in 30 TAC Chapter 307.

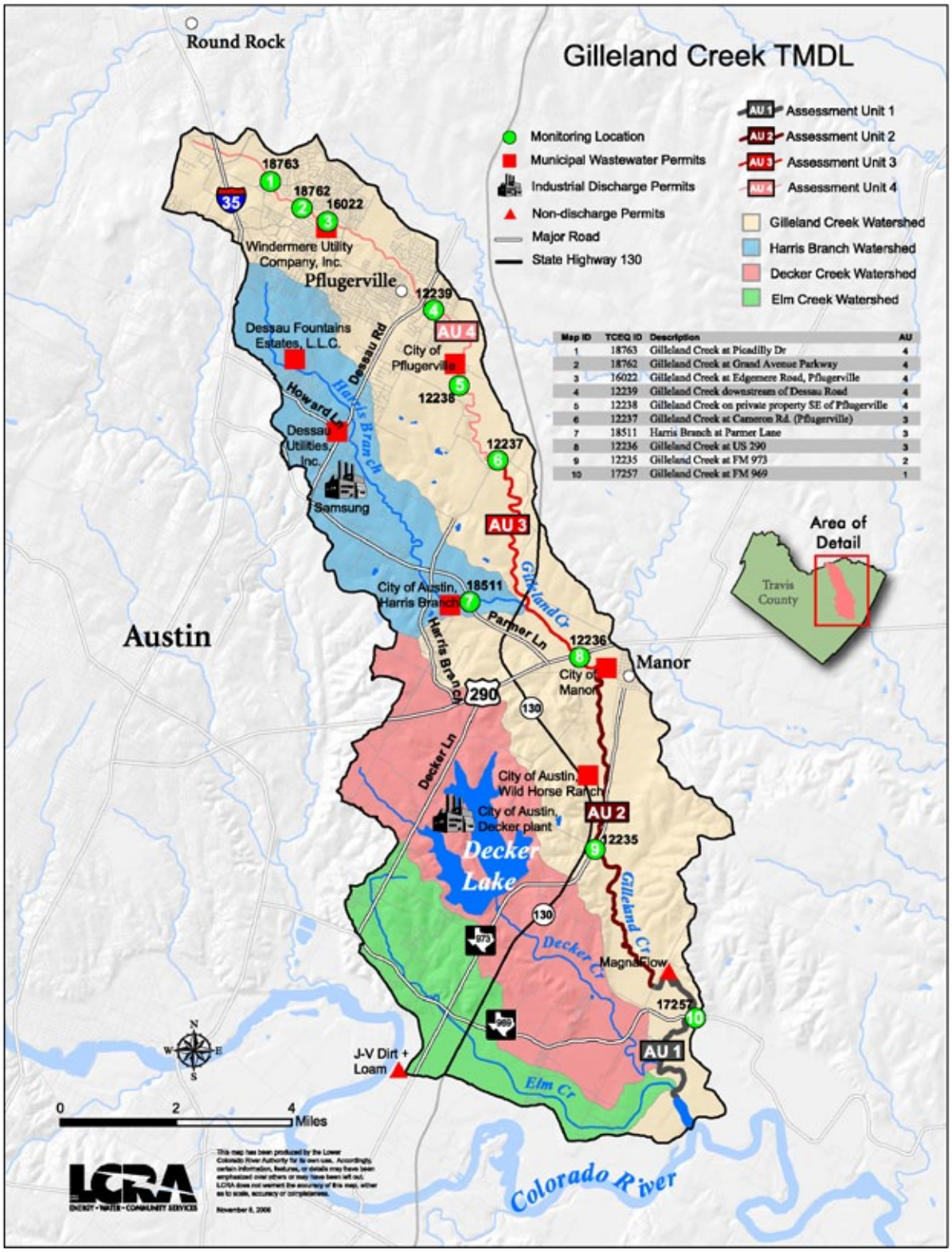

Figure 1. Gilleland Creek TMDL Watershed

Note: The monitoring site 20474 (Gilleland Creek at Northeast Metropolitan Park AU 4) is not referenced on this map, but is included as a monitoring site in this I-Plan.

Pollutant Sources and Loads

Sampling for the Gilleland Creek TMDL occurred between October 2005 and March 2006. The geometric mean concentration of *E. coli* exceeded the stream criterion of 126 cfu/100 ml during dry weather sampling at six out of the 10 sampling locations. During these conditions, effluent from WWTFs makes up the majority (approximately 83 percent) of the flow in Gilleland Creek. In wet weather conditions, *E. coli* concentrations exceeded the geometric mean criterion in all samples taken at the ten sampling locations.

The TMDL analysis utilized load duration curves (LDCs) to analyze sources and determine load reductions for the TMDL. LDCs define the relationship between flow (volume per time) and loadings (mass bacteria per time). The procedures for developing LDCs are explained more fully in the TMDL report. Results of the TMDL LDCs analyses determined that bacteria loads in the creek exceeded both the geometric mean and single sample criteria at high flow conditions (greater than 45 ft^3 /second) and moderate flow conditions (between 16.5 ft^3 /second and 45 ft^3 /second). The TMDL numbers presented below are based on the high flow conditions, which represent flows above the 90th percentile.

The TMDL analysis identified potential regulated and unregulated bacteria sources that could elevate bacteria levels in Gilleland Creek. Potential unregulated sources identified in the TMDL include malfunctioning OSSFs, agriculture practices, development, and pet, wildlife, and unmanaged animal waste. Regulated dischargers in the Gilleland Creek watershed include WWTFs, industrial facilities, municipal solid waste facilities, and regulated storm water dischargers.

The TMDL represents the maximum amount of pollutant that the stream can receive in a single day without exceeding the water quality standard. The final TMDL, including updates to the WQMP, for *E.coli* loadings to Gilleland Creek applied in the following equation:

$$TMDL = \sum WLA\ (MOS) + LA$$

Where:

WLA = waste load allocation (regulated source contributions);
LA = load allocation (unregulated source allocation); and
MOS = margin of safety.

Updates to TMDLs are made through the TCEQ's WQMP, which provides long-range planning and technical data for management activities as required under the Texas Water Code and the federal Clean Water Act. The following section summarizes the TMDL calculation for the WLA and LA; a more detailed explanation is in the TMDL report.

Waste Load Allocation (WLA)

The WLA is the waste load allocation for regulated source contributions in the watershed including WWTFs (WLA_{WWTF}) and regulated storm water ($WLA_{Regulated\ Storm\ Water}$).

Waste Load Allocation — Wastewater Treatment Facilities

TCEQ revised the Gilleland Creek TMDL through an update to the WQMP. The update included individual WLAs for each WWTF. The maximum permitted flow of the WWTFs including WLAs is summarized in Table 2.

Table 2. Maximum Permitted Flow and WLA for Each WWTF[3]

Facility Name and Permit Number	TPDES Permit Number	Permitted Flow (MGD)	Disinfection Method	Waste Load Allocation *E. coli* cfu/day
City of Pflugerville Upper Gilleland Creek	11845-002	5.3	Chlorination/ dechlorination	2.4×10^{10}
Windermere Utility Company	11931-001	2.0	Ultraviolet	0.91×10^{10}
Dessau Fountains Estates LLC/Silverado	12733-001	0.15	Chlorination	0.068×10^{10}
City of Austin (COA) Harris Branch	13318-001	2.0	Chlorination/ dechlorination	0.91×10^{10}
COA Wild Horse Ranch	10543-013	0.99	Ultraviolet	0.44×10^{10}
COA Harris Ridge, (formerly Dessau Utilities)	12971-001	0.5	Chlorine	0.23×10^{10}
COA Whisper Valley	10543-014	3.0	Ultraviolet	1.4×10^{10}

The WLA for WWTFs is derived from the equation:

WLA_{WWTF} = adjusted criterion * flow * unit conversion factor (#/day)

Where:

Adjusted criterion = 120 cfu/100 ml *E. coli* (the standard of 126 cfu/100 mL – 5 percent for MOS = 120 cfu/100mL)
Flow = total maximum permitted flow (MGD)
Unit conversion factor = 37,854,120 (mL/gal)

$WLA_{Total\ WWTFs} = 6.35 \times 10^{10}$ cfu/day

Waste Load Allocation — Regulated Storm Water

The April 2009 update to the WQMP also included an aggregate WLA for Municipal Separate Storm Sewer System (MS4) permittees in the watershed. Previously, loads from MS4 permittees were part of the LA (unregulated loads). The update moved the MS4 storm water load from the LA to the $WLA_{RegulatedStormWater}$.

[3] In late 2009, Dessau Fountain Estates began routing influent to the City of Austin's (COA) Walnut Creek WWTF. Dessau Fountain Estates continues to maintain the wastewater collection system. The effluent no longer discharges into Harris Branch in the Gilleland Watershed and instead is conveyed to Walnut Creek for treatment and discharge. A WQMP update will be submitted documenting this change. COA's Whisper Valley WWTF is in the planning phase and is expected to be constructed in the next five years. TCEQ issued a discharge permit containing a provision for *E. coli* monitoring for the planned facility and an *E. coli* current daily effluent limit of 126 cfu/100 ml. When this permit is renewed, the daily effluent limit will be 120 cfu/100 mL based on the adjusted criterion in the TMDL. The City of Pflugerville Upper Gilleland Creek Permit will also be revised to 120 cfu/100mL when renewed.

At the date of this plan, five dischargers in the watershed held an MS4 permit (Phase I or Phase II). Urban population growth trends and expanding residential/commercial development in the Greater Austin Metropolitan Area signal a shift from agricultural land use to an urbanized land use. Changing land use percentages in the watershed will necessitate updates to the TMDL through WQMP updates to reflect the latest load conditions.[4]

To the extent that the MS4 permittees are implementing their respective storm water management plans (SWMPs), their permits are considered consistent with the Gilleland Creek Bacteria TMDL and this I-Plan. The MS4 permittees are committed to a focus that optimizes implementation of measures within the Gilleland Creek watershed. Each permittee will implement its SWMP, as necessary, to target reductions in the waste load of bacteria from those portions of their MS4s that are located within the Gilleland Creek watershed.

WLARegulatedStormWater = 1.51 x 1013 cfu/day

Total WLA
WLA = WLATotal WWTFs + WLARegulatedStormWater
WLA = 6.35 x 1010 cfu/day +1.51 x 1013 cfu/day
WLA = 1.52 x 1013 cfu/day

Load Allocation (LA)
The load allocation is the sum of loading from all unregulated sources. Bacteria loads in the creek exceeded both the geometric mean and single sample criteria at high flow and moderate flow conditions. The TMDL calculated the LA as:

At high flow
LA= 1.09 x 1013 cfu/day

Total Loads
With the explicit MOS incorporated into the WLA, as described previously, total loads were calculated using the equation:

$$TMDL = \sum WLA + LA$$

TMDL = 1.52 x 1013 cfu/day + 1.09 x 1013 cfu/day
TMDL = 2.61 x 1013 cfu/day

Implementation Strategy

This plan documents six management measures and one control action to reduce bacteria loads. Management measures are voluntary activities, such as restoring and improving

[4] TCEQ did not include individual load allocations for the individual MS4 permits in the watershed when calculating the TMDL; instead, an aggregate value was used. The current MS4 permits in the watershed include City of Austin MS4 WQ0004705000, City of Pflugerville MS4 TXR040078, City of Round Rock MS4 TXR040253, Travis County MS4 TXR040327, and Texas Department of Transportation TXR15NH52.

riparian buffer zones. Control actions are regulatory activities, such as monitoring *E.coli* concentrations in WWTF effluent. Management measures were selected based on feasibility, costs, support, and timing. Implementation activities can be implemented in phases based on the needs of the stakeholders and the progress made in improving water quality.

Adaptive Implementation

All I-Plans are implemented using an adaptive management approach in which measures are periodically assessed for efficiency and effectiveness. This adaptive management approach is one of the most important elements of the I-Plan. The iterative process of evaluation and adjustment ensures continuing progress toward achieving water quality goals, and expresses stakeholder commitment to the process.

At annual meetings hosted by TCEQ, the stakeholders will periodically assess progress using the schedule of implementation, interim measurable milestones, water quality data, and the communication plan included in this document. If periodic assessments find that insufficient progress has been made or that implementation activities have improved water quality, the implementation strategy will be adjusted.

Activities and Milestones

After drafting the TMDL document, the Gilleland Creek Stakeholder Advisory Group began developing the I-Plan during the spring 2007. The Stakeholder Advisory Group formed six work groups to complete the I-Plan including Ordinances and Planning, Storm Water, OSSF, Wastewater, Education and Outreach, and Natural Resource Management. Between spring 2007 and fall 2008, the work groups met 33 times.

Each work group considered bacteria loading sources in the watershed, and developed detailed, consensus-based action plans. The management measures contained in this I-Plan are the products of the work groups. The reports of the work groups can be found on the TCEQ website at: <www.tceq.texas.gov/implementation/water/tmdl/69gillelandcreek bacteria.html>.

The Gilleland Creek I-Plan includes the six stakeholder-developed management measures and one control action described in the following sections.

Management Measures and Control Action

Management Measures

1) *Identify, prioritize, inspect, and bring into compliance malfunctioning OSSFs.*
2) *Restore and preserve riparian zones to protect water quality.*
3) *Determine the effectiveness of retrofitting existing storm-water detention basins to also perform as water quality facilities to reduce bacteria concentrations.*
4) *Partners coordinate to develop a general campaign to raise public awareness of unregulated contributions of bacteria pollution, specifically pet waste.*
5) *Develop and adopt equivalent water quality ordinances between government jurisdictions.*

6) *Conduct visual inspection of wastewater collection systems within 100 ft from the centerline of Gilleland Creek and its tributaries.*

Control Action

1) *Monitor and report effluent E. coli concentrations from WWTFs.*

Management Measure 1.0

Identify, prioritize, inspect, and bring into compliance malfunctioning OSSFs in the Gilleland Creek watershed.

The purpose of this management measure is to identify the location of the OSSFs (5,000 gallons or less) in the watershed, prioritize those systems that would have the most impact on water quality and inspect those systems given the highest priority. Travis County, City of Austin (COA), and the TCEQ have the authority to implement these inspections in the watershed. TCEQ has authorized Travis County and the COA to enforce the rules of the Texas Health and Safety Code and the Texas Administrative Code for those systems within their jurisdictions. By default, the TCEQ has jurisdiction over the remaining areas.

Estimates suggest that there are more than 2,000 OSSFs in the Gilleland Creek watershed. Sixty of these systems are within the Special Flood Hazard Area based on current mapping identified by the Federal Emergency Management Agency (FEMA). The COA, a TCEQ authorized agent, has identified approximately 45 OSSFs within its jurisdiction that are in the Gilleland Creek watershed. Travis County has identified approximately 2,000 systems within their jurisdiction. Approximately 125 systems have been identified within TCEQ's jurisdiction in the watershed.

The first step is to identify OSSFs within the watershed and determine the authorized agent. Travis County and COA have worked together to identify OSSFs in the watershed and will continue to work together to identify OSSFs using available geo-coded information. To identify OSSFs without a permit or that are not mapped, Travis County and COA will check and cross check available databases such as water-only utility records.

The OSSF work group[5] developed an inspection prioritization form (Appendix B) which identified OSSFs with a higher potential to malfunction. The prioritization process includes such factors as: age of the system, existence of a maintenance contract, proximity to Gilleland Creek or its tributaries, flood zones, tract size, commercial or residential use, soils in the area and the existence of a public water supply.

Using the agreed upon Gilleland Creek OSSF inspection form (Appendix B), authorized agent staff will walk the OSSFs disposal areas to look for obvious signs of system malfunction. Portable global positioning systems (GPS) will be used to obtain the geographic coordinates for the inspected OSSFs that can be used in future databases or mapping. Facilities that are malfunctioning and could be a potential source of bacterial

[5] OSSF Workgroup members included representatives from the COA, City of Pflugerville, Travis County, LCRA, and TCEQ.

contamination to Gilleland Creek will be handled in accordance with the authority of the authorized agent.

GPS information collected during the inspection process will be mapped for future reference. In addition to mapping the location of all systems, an overlay will be developed identifying those holding certificates of convenience and necessity for water and wastewater service in the Gilleland Creek Watershed.

The Lower Colorado River Authority (LCRA), in cooperation with Travis County and COA, will lead two workshops to educate OSSF owners. The goals of the workshops are to inform OSSF owners about general use and proper maintenance of their OSSFs, and about how to identify when the system is malfunctioning. Local media and Texas AgriLife Extension Service may be used to advertise the workshops and the benefits of attending. Additional homeowner educational materials are available including the Guadalupe Blanco River Authority's interactive website: http://www.gbra.org/septic.swf. Educational materials will be distributed in the watershed and to OSSF owners as part of inspections. COA will distribute the LCRA OSSF educational booklets twice with monthly bills yearly or as needed. Travis County will mail the booklet to OSSF owners with their permits or as a separate, direct mail out.

Responsible Parties and Funding

- Travis County, Transportation and Natural Resources Department
- Austin Water Utility, Utility Development Services
- LCRA
- OSSF owners of malfunctioning systems
- TCEQ

Travis County and COA staff will inspect priority systems as a routine duty. No additional financial outlay of resources is expected to be necessary in order to perform inspections of the OSSFs located within the Gilleland Creek watershed. The inspection of systems will be done a few systems at a time as time permits for Travis County and COA OSSF staff.

Limited funds are available to help OSSF owners make repairs or replace a malfunctioning OSSF. Two options are available. One option is the Austin Area Urban League Group (emergency home repair program) has a contract with the COA's Neighborhood Housing and Community Development program to offer financial assistance for malfunctioning OSSFs. The second is for OSSF owners that live in certain rural areas of Travis County and meet income and age criteria may be eligible for financial assistance to repair or replace a malfunctioning OSSF through the U.S. Department of Agriculture (USDA).

TCEQ's Supplemental Environmental Project (SEP) is a potential funding source for the authorized agents to provide grants to OSSF owners to make necessary repairs. The Texas Association of Resource Conservation and Development (RC&D) maintains a statewide SEP that establishes a mechanism to provide funding to repair or replace failing OSSFs for low-income homeowners statewide. The Central Texas RC&D Area administers this SEP in Travis County.

Measurable Milestones[6]

In Year One, Travis County, COA, and TCEQ will use available data to create a map to identify OSSFs and appropriate authorized agents in the watershed and to create a prioritized list for inspection and will inspect up to 10 percent of the highest priority OSSFs.[7] LCRA and partners will conduct one workshop for OSSF owners in the watershed. Educational materials will be distributed in the watershed and to OSSF owners as part of inspections. Travis County and COA will mail the booklet to OSSF owners with their permits or as a separate, direct mail out. Partners will update the larger stakeholder group at the TCEQ hosted annual stakeholder meeting beginning this year and continuing for up to the next five years.

In Year Two, Travis County, COA, and TCEQ will inspect up to the next highest 15 percent priority OSSFs. Educational materials will be distributed as part of these inspections. Travis County and COA will mail the LCRA booklets to OSSF owners with their permits or as a separate, direct mail out. LCRA and partners will conduct the second workshop for OSSF owners in the watershed. Travis County, COA, and TCEQ will create a map that identifies OSSFs that could be connected to a centralized WWTF. Partners will update stakeholders at the TCEQ hosted annual stakeholder meeting.

In Year Three, Travis County, COA, and TCEQ will inspect up to the next highest 25 percent priority OSSFs and will distribute educational materials as part of these inspections, or approved permits. Status reports will be provided to stakeholders at the TCEQ hosted annual stakeholder meeting.

In Year Four, Travis County, COA, and TCEQ will inspect and provide educational materials for up to the next 25 percent of priority OSSFs, and will update stakeholders at the annual TCEQ hosted stakeholder meeting. Educational materials will be distributed with approved permits.

In Year Five, partners will evaluate the effectiveness of implementing this management measure in achieving the water quality goals of the TMDL and make appropriate adjustments. If this program is found to be successful, Travis County, COA, TCEQ will inspect the remaining priority OSSFs. Educational materials will continue to be distributed as part of permit applications and inspections.

Each year, identified malfunctioning OSSFs will be repaired or replaced. If a malfunctioning OSSF is in close proximity to a sanitary sewer collection system, options to connect these residential or commercial structures into a sanitary sewer collection system will be investigated.

Table 3 provides additional details about Management Measure 1.0. Appendix A provides a schedule of implementation.

---

[6] Year One begins once the TCEQ approves the I-Plan.

[7] The number of systems inspected will be calculated based on an aggregate value of all participating authorized agents. Each authorized agent will not be required to inspect a certain percentage of systems each year.

Table 3. On-Site Sewage Facilities Management Measure Summary

Causes and Sources: Nonpoint sources from malfunctioning OSSF

Key Elements

(1) Management Measure	**Identify, prioritize, inspect, and bring into compliance malfunctioning OSSFs in the Gilleland Creek watershed.**			
(2) Potential Load Reduction (cfu/day)	1.05×10^{11} cfu/day	Estimated using an equation from EPA's 2001 *Protocol for Developing Pathogen TMDLs.*	Appendix C provides additional calculation information.	
(3) Technical and Financial Assistance Needed	Technical Two workshops to educate OSSF owners about maintenance and malfunctioning systems.	Financial The inspection of prioritized systems will be performed as a routine duty. No additional financial outlay of resources is expected.	Resources needed to repair malfunctioning systems will vary with each system.	The system owner is responsible for repairing the system. Funding assistance information will be provided.
(4) Education Component	Workshops for OSSF owners.	Distribute educational materials.	Existing web sites show proper OSSF maintenance. LCRA educational booklets are available for distribution by Travis County and COA.	Status updates through TCEQ-hosted annual stakeholder meeting.
(5) Schedule of Implementation	Year One: Map OSSFs and prioritize for inspections. Distribute educational materials. Hold one workshop. Inspect up to 10% of highest priority OSSFs.	Year Two: Inspect up to 15% of the systems. Distribute educational materials. Hold second workshop. Repair or replace malfunctioning OSSFs.	Year Three and Four: Inspect up to 25% of systems; distribute educational materials. Malfunctioning OSSFs repaired or replaced.	Year Five: Partners evaluate and make adjustments. Remaining priority OSSFs inspected.
(6) Interim, Measurable Milestones	Number of OSSFs inspected.	The number of malfunctioning OSSFs repaired or replaced.	Partners performing inspections will create a map of OSSF systems within the watershed from GIS points collected at inspections and from historical data.	
(7) Progress Indicators	A reduction in *E. coli* concentrations in 4 creek AUs.	Contributions reduced due to repair or replacement of malfunctioning OSSFs.		
(8) Monitoring Component	LCRA- and TCEQ-approved QAPP routine water quality monitoring.	Other sources of data including COA, the Colorado River Watch Network (CRWN), and other affiliated citizen-monitoring efforts.		
(9) Responsible Organization	Travis County and COA Perform inspections. Distribute educational materials.	TCEQ Perform inspections and host annual meetings.	LCRA Provide two technical workshops to OSSF owners. Provide educational materials.	OSSF owners Repair malfunctioning systems.

Management Measure 2.0

Restore and preserve riparian zones to protect water quality.

To implement this measure, the stakeholders explored a range of existing nonprofit and governmental (local, regional, state, and federal) programs to work with landowners to accomplish the overall goal of restoring and protecting creek-side riparian zones within the watershed. These programs are described below.

Though land uses in the watershed have changed and continue to change, a large percentage of the Gilleland Creek watershed can still be characterized as rural or undeveloped. The watershed encompasses 48,617 acres of which 20,867 acres, or 43 percent, remain undeveloped or are used for agricultural purposes. The majority of the agricultural land, 20, 339 acres, is classified as tax exempt. The changing nature of the land use from rural to suburban, may limit the level of involvement in some of the projects proposed for this management measure.

Texas State Soil and Water Conservation Board

The TSSWCB is the lead agency in Texas responsible for planning, implementing and managing programs and practices for preventing and abating agricultural and silvicultural (forestry-related) nonpoint source pollution (Texas Agriculture Code §201.026). In accordance with this responsibility, the TSSWCB administers a certified Water Quality Management Plan (WQMP) Program that provides, through local soil and water conservation districts (SWCDs), for the development, implementation, and monitoring of individual WQMPs for agricultural and silvicultural lands. Each WQMP is developed, maintained, and implemented under rules and criteria adopted by the TSSWCB. A WQMP achieves a level of pollution prevention or abatement consistent with the state's water quality standards.

A WQMP is a site-specific plan designed to assist landowners in managing nonpoint source pollution from agricultural and silvicultural activities. WQMPs are traditional conservation plans based on the criteria outlined in the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Field Office Technical Guide (FOTG). The FOTG is the best available technology and is tailored to meet local needs.

A WQMP includes appropriate land treatment practices, production practices, management measures, technologies, or combinations thereof. WQMPs are developed in cooperation with the landowner with assistance from the NRCS and approved by the local SWCD and are certified by the TSSWCB. This approach to preventing and abating nonpoint source pollution uses a voluntary approach while affording the landowner a mechanism for compliance with the state's water quality standards.

The TSSWCB regularly performs status reviews on WQMPs to ensure that the producer is implementing the measures prescribed in the WQMP. The TSSWCB administers technical and cost-share assistance programs to assist producers in implementing their WQMPs. The TSSWCB utilizes both state general revenue and federal grants to fund the WQMP Program.

Several essential practices from the NRCS FOTG included in a WQMP are of specific applicability to the bacteria reduction goals of this TMDL and I-Plan. A grazing management system is a vital component of a WQMP for livestock operations.

Grazing management examines the intensity, frequency, duration and season of grazing to promote ecologically and economically stable relationships between livestock and forage species. The distribution of grazing animals is managed to maintain adequate and desired vegetative cover, including on sensitive areas like riparian corridors. Livestock distribution is managed through cross-fencing, alternate water sources, supplemental feed placement, and shade or cover manipulation. The expected forage quality, quantity, and species are analyzed to plan for an appropriate forage-animal balance. Grazing management systems plan for potential contingencies such as severe drought, wildfires, or flooding in order to protect the resource, protect grazing animals, and reduce economic risk.

The TSSWCB, in collaboration with NRCS and the Taylor SWCD #513, will continue to provide technical assistance to landowners in developing and implementing WQMPs. TSSWCB will develop WQMPs on 100% of livestock operations in the Gilleland Creek watershed who request planning assistance through the SWCD. TSSWCB will annually perform status reviews on at least 50% of all WQMPs in the Gilleland Creek watershed.

Since the beginning of the TSSWCB WQMP Program in 1995, cost-share (state general revenue) has been allocated to SWCDs in priority areas across the state and obligated by the SWCDs to individual producers. A lesser amount of cost-share is reserved by TSSWCB for individual producers and SWCDs not in priority areas. Neither the Taylor SWCD #513 nor Gilleland Creek is in a priority area. Livestock producers in the Gilleland Creek watershed seeking cost-share from TSSWCB to implement specific BMPs prescribed in a WQMP may request funding through the statewide, non-priority area allocation.

Soil and Water Conservation Districts

A SWCD, like a county or school district, is a subdivision of state government. SWCDs are administered by a board of five directors who are elected by their fellow landowners. There are 216 individual SWCDs organized in Texas. Through decades old agreements, SWCDs offer agricultural landowners and operators technical assistance through a partnership with the NRCS and the TSSWCB. It is through this conservation partnership that local SWCDs are able to furnish technical assistance to farmers and ranchers in the preparation of a complete soil and water conservation plan to meet each land unit's specific capabilities and needs. The Gilleland Creek watershed is wholly within the Taylor SWCD #513.

U.S. Department of Agriculture Natural Resources Conservation Service

The NRCS is a federal agency that works hand-in-hand with Texans to improve and protect their soil, water and other natural resources. For decades, private landowners have voluntarily worked with NRCS specialists to prevent erosion, improve water quality, and promote sustainable agriculture.

The NRCS provides conservation planning and technical assistance to landowners, groups, and units of government to develop and implement conservation plans that protect, conserve, and enhance their natural resources. When providing assistance, NRCS focuses on the sound use and management of soil, water, air, plant, and animal resources. NRCS

helps customers manage their resources in a way that prevents resource degradation, ensures sustainability, allows for productivity, and respects the customers' needs. Conservation planning can make improvements to livestock operations, crop production, soil quality, water quality, and pastureland, forestland, and wildlife habitats. The NRCS also integrates ecological and economic considerations in order to address private and public concerns.

The NRCS administers numerous Farm Bill Programs authorized by the U.S. Congress that provide financial assistance for many conservation activities:

- Conservation Innovation Grants (CIG)
- Conservation Stewardship Program (CSP)
- Environmental Quality Incentives Program (EQIP)
- Agricultural Water Enhancement Program (AWEP)
- Farm and Ranch Lands Protection Program (FRPP)
- Grassland Reserve Program (GRP)
- Wetlands Reserve Program (WRP)
- Wildlife Habitat Incentives Program (WHIP)
- Conservation Reserve Program (CRP) administered by USDA Farm Service Agency

EQIP and other programs were reauthorized in the federal Food, Conservation, and Energy Act of 2008 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. People who are engaged in livestock or agricultural production on eligible land may participate in EQIP. EQIP offers financial and technical assistance to eligible participants for installation or implementation of structural and management practices on eligible agricultural land.

EQIP also provides incentive and cost-share payments to implement conservation practices. EQIP activities are carried out according to a plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice(s) to address resource concerns. All practices are subject to NRCS technical standards described in the FOTG and adapted for local conditions. The local SWCD approves the plan.

Local Work Groups provide recommendations to USDA-NRCS on allocating EQIP county base funds and on resource concerns for other USDA Farm Bill programs. Gilleland Creek stakeholders are encouraged to participate in the Local Work Group in order to promote the goals of this I-Plan Management Measure as compatible with the resource concerns and conservation priorities for EQIP.

LCRA Creekside Conservation Program

Since 1990, the LCRA Creekside Conservation Program has promoted reduction of soil erosion and abatement of nonpoint source pollution through the voluntary implementation of BMPs and conservation plans by landowners across LCRA's statutory district. A Creekside Conservation Program conservation plan is site-specific to individual agricultural lands directly along or adjacent to riparian areas and is developed in collaboration with NRCS and local SWCDs. All Best Management Practices (BMPs) used in conservation plans are subject to NRCS technical standards described in the FOTG, and

include, but are not limited to cross fencing, slope stabilization, vegetative buffers along creeks, range seeding and pasture planting, alternative water source development for livestock, and rotational grazing systems.

Landowners may be reimbursed up to 50 percent of the actual cost of the pre-approved projects through the program. Since 2004, the Creekside Conservation Program has been supported through CWA §319(h) nonpoint source grants from TSSWCB. These grants have provided funds to LCRA for the provision of technical and financial assistance to program participants. By utilizing LCRA funds leveraged with the §319-funds, the maximum cost-share amount reimbursable is up to $20,000 per individual landowner. While not required for participation in the Creekside program, landowners are encouraged to obtain a WQMP certified by TSSWCB.

Through the current grant funding, LCRA will target and prioritize conservation planning efforts and cost-share availability in areas adjacent to and along impaired water bodies within LCRA's statutory district, including a specific priority area for Gilleland Creek. The current grant funding for cost-share is available through the end of FY2011.

U.S. Fish and Wildlife Service (USFWS) Partners for Fish and Wildlife Program

The goal of this program is to create habitats for migratory birds by improving wildlife habitat, which could involve the construction of a BMP pond to detain storm water runoff. The USFWS program is open to all landowners, even those in urban settings. It requires a 10-year commitment from landowners, who will be reimbursed when the project is completed. USFWS has committed to up to $25,000 for projects in the Gilleland Creek watershed that protect federal trust species such as migratory waterfowl. The goal of the Partners for Fish and Wildlife Program is to secure at least 50 percent of project costs, including cash and in-kind services, from other sources.

Texas Parks and Wildlife Private Lands Services

Texas Parks and Wildlife Department (TPWD) Private Lands Services is a program for private landowners to provide practical information on ways to manage wildlife resources consistent with other land use goals, to ensure plant and animal diversity, to provide aesthetic and economic benefits, and to conserve soil, water and related natural resources. To participate, landowners may request assistance by contacting the TPWD district serving their county <www.tpwd.state.tx.us/landwater/land/technical_guidance/biologists/>.

TPWD's only cost share program is the Landowner Incentive Program (LIP). To learn more about TPWD's LIP or request assistances from a TPWD biologist, visit the web site: <www.tpwd.state.tx.us/landwater/land/private/lip/>, which explains the types of projects funding by LIP. Once the property's potential has been determined, a biologist will provide recommendations and, if requested, help the landowner develop a written wildlife management plan. Other funding opportunities may be available through various USDA programs.

Texas Wildlife Services, Feral Hog Abatement Program

Feral hogs have been identified as significant contributors of pollutants to water bodies. As feral hogs congregate around water sources to drink and wallow, this concentration of high

numbers of feral hogs in small riparian areas poses a threat to water quality. Fecal matter deposited directly in streams by feral hogs contributes bacteria and nutrients, polluting the state's water bodies. In addition, extensive rooting activities of groups of feral hogs can cause extreme erosion and soil loss. The destructive habits of feral hogs cause an estimated $52 million worth of agricultural crop and property damage each year in Texas. Stakeholders in watersheds across the state, including Gilleland Creek, have recommended that efforts to control feral hogs be undertaken to reduce the population, limit the spread of these animals, and minimize their effects on water quality and the surrounding environment.

Texas Wildlife Services, through cooperative agreements between Texas AgriLife Extension Service and USDA Animal and Plant Health Inspection Service, provides statewide leadership in the science, education, and practice of wildlife and invasive species (feral hogs) management to protect the state's agricultural, industrial and natural resources, as well as the public's health, safety, and property (Texas Health and Safety Code Chapter 825).

Prevention and management of wildlife conflicts is an essential and responsible part of wildlife management. The complex wildlife-damage management environment includes a combination of biological, legal, socio-political, financial, and technical considerations. Texas Wildlife Services accomplishes this through cooperation with federal, state, and private entities, servicing both rural and urban areas, utilizing technical assistance and direct control services in this specialized field of wildlife management.

Texas Wildlife Services has always been available to provide assistance with addressing feral hogs and will remain available to all citizens of the state. While direct control will be limited to availability of personnel in cooperative association areas, technical assistance can be provided to individuals on how to best resolve feral hog problems. Since 2008, the Texas Department of Agriculture has awarded grants (state general revenue) to Texas Wildlife Services for a feral hog abatement program. The grants are used to carry out a number of specially identified direct control projects where control efforts can be measured. Certain areas of the state have been targeted due to the contributions from feral hogs to impaired water quality and bacteria loading.

Through cooperative funding from the COA, Texas Wildlife Services has stationed a Wildlife Damage Management Technician in Travis County dedicated to the control and/or eradication of feral hogs. This position is funded through the end of September 2010, but may be extended based on the availability of funds.

Trust for Public Land, Greenprint for Growth

The Trust for Public Land (TPL) is a national, nonprofit, land conservation organization that conserves land for people to enjoy, preserves land to ensure clean drinking water, and protects the natural beauty of waterways. One way TPL accomplishes this initiative is through "Greenprinting" — a geographic information system (GIS) technology that helps communities identify the most important watershed lands for preservation. The waterways and 100-year floodplain in the Gilleland Creek watershed were given a high conservation priority while the adjacent lands were given a moderate to high conservation priority in the TPL's *Travis County Greenprint for Growth*. The TPL will help the local governments

within Travis County, to raise funds for watershed acquisition and to help them work with private landowners to acquire watershed land. It is envisioned that TPL may purchase riparian areas near Gilleland Creek or its tributaries to designate the area as public land and preserves.

City of Pflugerville, Acquisition of Riparian Corridor Land

The City of Pflugerville purchased a number of acres of land adjacent to Gilleland Creek and established this acreage as parkland. Recently, the City of Pflugerville purchased 5.95 acres of land near Gilleland Creek prior to the expansion of the adjacent Pecan Street. The City funded the acquisition through a combination of General Funds and Certificates of Obligation. The purpose of the acquisition was to preserve lands within the Gilleland Creek riparian corridor. Additional riparian corridor preservation efforts may occur via the parkland dedication and development process and/or land purchase based on the suitability and available funds.

The City of Pflugerville also recognizes the value of increased focus on street sweeping in areas adjacent to creeks and riparian zones. The City of Pflugerville has proposed to purchase equipment and increase staffing as funding becomes available. The objective of the street sweeping near creeks and riparian zones is to reduce runoff containing suspended solids into the creek, to reduce bacteria loading and other pollutants in runoff.

Texas AgriLife Extension Service

AgriLife Extension, an agency of The Texas A&M University System, provides quality, relevant, outreach and continuing education programs and services to Texans. AgriLife Extension serves every county in Texas; its information is provided by scientists and researchers at Texas A&M and other universities, and is made practical and relevant by Extension educators or agents who work in each county. AgriLife Extension continually assesses and responds to educational needs identified by community residents, advisory committee members, volunteers, stakeholder groups, and representatives of organizations and agencies. Extension education encompasses the broad areas of agriculture and natural resources, community economic development, family and consumer sciences, and youth development programs such as 4-H.

Among other goals and priority objectives pursued by AgriLife Extension, the following relate to agriculture and natural resources:

- Consumers, homeowners, agricultural producers, communities, and irrigation districts understand and adopt BMPs to protect water quality and enhance conservation so water supplies will meet future water needs in Texas that are essential for expanding agricultural growth, jobs, and the economy in both rural and urban areas.

- Landowners, professional ecosystem managers, community planners, and other interest groups become more knowledgeable, make informed decisions, and adopt BMPs that insure the proper management of rural and urban natural ecosystem resources through stewardship education in order to support the biological, sociological, and economic sustain-ability of those resources.

- Advance the planning and management of natural resource-based recreation opportunities in Texas.

Funded with TSSWCB CWA §319(h) nonpoint source grants, Texas AgriLife Extension Service and the Texas Water Resources Institute are developing the *Lone Star Healthy Streams – Grazing Cattle* curriculum. Once developed, this educational program will be delivered statewide and serve as the foundation for landowners' understanding of the effects of grazing cattle on bacteria loading to streams and BMPs designed to reduce bacteria from grazing cattle. The curriculum will promote the adoption of BMPs and participation in federal and state cost-share programs.

In concert with curriculum development, AgriLife Extension is evaluating the effectiveness of selected BMPs in reducing bacteria loading from grazing cattle to streams. BMPs being evaluated include grazing management, shade, fencing, alternative water source development, riparian buffers, and combinations thereof. The project is scheduled to end March 2011.

The project workplan and approved Quality Assurance Project Plan are available at <www.tsswcb.state.tx.us/managementprogram/lonestar>. TSSWCB is working with AgriLife Extension to develop scopes of work to continue funding BMP effectiveness studies. Once the curriculum is developed, TSSWCB and AgriLife Extension will deliver the program to cattlemen in the Gilleland Creek watershed. More information on this project is available at <http://grazinglands-wq.tamu.edu/>.

Funded with TSSWCB CWA §319(h) nonpoint source grants, Texas AgriLife Extension Service and the Texas Water Resources Institute are developing the *Lone Star Healthy Streams – Horses* curriculum. Once developed, this educational program will be delivered statewide and serve as the foundation for landowners' understanding of the effects of horses on bacteria loading to streams and BMPs designed to reduce bacteria from horses.

The project is scheduled to end December 2010. The project workplan is available at <www.tsswcb.state.tx.us/managementprogram/copanoedu>. Once the curriculum is developed, TSSWCB and AgriLife Extension will deliver the program to horse owners in the Gilleland Creek watershed.

Funded with TSSWCB CWA §319(h) nonpoint source grants, Texas AgriLife Extension Service and the Texas Water Resources Institute are developing the *Lone Star Healthy Streams – Feral Hogs* curriculum. Once developed, this educational program will be delivered statewide and serve as the foundation for landowners' understanding of the effects of feral hogs on bacteria loading to streams and control techniques designed to abate feral hogs and reduce their bacteria loading.

Concurrent with curriculum development, and with TSSWCB 319-funding, AgriLife Extension has developed

- a series of six publications (a seventh in development) addressing management strategies and techniques for feral hog control, and

- an on-line feral hog activity reporting system to support identification of target areas for implementation of feral hog control activities.

While both the series of publications and the on-line reporting tool are being piloted in the Plum Creek watershed, they have statewide applicability to watersheds impacted by feral hogs, including Gilleland Creek. The curriculum development project is scheduled to end October 2012.

The project workplan is available at <www.tsswcb.state.tx.us/managementprogram/lonestar2>. Once the curriculum is developed, TSSWCB and AgriLife Extension will deliver the program to landowners working to control feral hogs in the Gilleland Creek watershed. TSSWCB and AgriLife Extension will work with LCRA to distribute the series of publications to Gilleland Creek landowners and promote the use of the on-line reporting tool. More information on the publications and on-line reporting tool is available at <http://plumcreek.tamu.edu/FeralHogs>.

Responsible Parties and Funding

- Governmental (local, regional, state, and federal) and Non-Governmental Programs / Agencies
- Local Landowners
- TCEQ

The intent of these programs is for the agencies listed under Management Measure 2 to work with landowners to voluntarily protect riparian areas. Technical assistance to agricultural producers in developing WQMPs provided through the TSSWCB WQMP Program is funded through state general revenue. It is not anticipated that any new sources of funding will be required to implement this management measure, depending on continued appropriations from the Texas Legislature.

TSSWCB and NRCS will continue to provide appropriate levels of cost-share assistance to agricultural producers that will facilitate the implementation of BMPs and WQMPs in the Gilleland Creek watershed, as described in this management measure. As was previously discussed, the land use dynamics are rapidly changing in the Gilleland Creek watershed shifting from a agricultural landscape to urban development. As such, TSSWCB expects the demand for cost-share to implement WQMPs to be very low and, therefore does not anticipate establishing a priority area for Gilleland Creek.

The TSSWCB expects that existing levels of cost-share funding reserved for statewide, non-priority area use will be sufficient, depending on continued appropriations from the Texas Legislature, to satisfy demand and need for cost-share in Gilleland Creek. NRCS expects that existing levels of financial assistance available through multiple Farm Bill programs will be sufficient, depending on continued appropriations from the U.S. Congress, to satisfy demand and need in Gilleland Creek.

TSSWCB and LCRA anticipate that grant funding will be necessary to provide technical and cost-share assistance to agricultural producers through the Creekside Conservation Program. Potential future grant funding for the Creekside Conservation Program would

apply across the entire LCRA statutory district, with specific focus on agricultural lands adjacent to impaired water bodies, including a specific priority area for Gilleland Creek.

TSSWCB and AgriLife Extension anticipate that grant funding will be necessary to deliver the Lone Star Healthy Streams curricula (grazing cattle, horses, feral hogs) to landowners statewide, including program delivery targeted to Gilleland Creek.

Texas Wildlife Services anticipates that additional cooperative funding will be necessary to continue the focused feral hog control activities.

Measurable Milestones

In Year One, interested landowners in the watershed will contact the appropriate agency to participate in selected technical and financial assistance programs.[8] Responsible parties will work together to promote the availability of technical and financial assistance programs and encourage individual landowner participation. An additional landowner workshop may be necessary. The agencies will work with landowners to develop and implement WQMPs or conservation plans on undeveloped land in riparian areas. Feral hog management publications will be distributed to landowners; direct feral hog control activities will be conducted based on fiscal and human resource constraints. Other projects listed in the plan will begin as funding allows.

In Years Two, Three, and Four, agencies will continue to work with individual interested landowners in selected technical and financial assistance programs. Other projects listed in the plan begin as funding allows. Delivery of Lone Star Healthy Streams curricula (grazing cattle, horses, feral hogs) will be scheduled at appropriate frequency and timing in Years Two and beyond if needed. Educational field days will be conducted at appropriate frequency and timing to encourage and promote landowner participation in programs. Other projects listed in the plan begin as funding allows. Education about feral hog management and direct feral hog control will continue as necessary, limited by fiscal and human resource constraints.

In Year Five, partners will evaluate the effectiveness of implementing this Management Measure in achieving the water quality goals of the TMDL and make appropriate adjustments to specific strategies and BMPs and availability of technical and financial assistance programs.

Table 4 provides additional details for Management Measure 2.0. Appendix A provides the schedule of implementation.

[8] In 2008, LCRA and its partners hosted a landowner workshop to educate local citizens about land management practices that conserve soil and water. Because of the workshop, five property owners in the watershed expressed interest in participating in one of the programs.

Table 4. Natural Resource Management Measure Summary

Causes and Sources: Storm water runoff from undeveloped land in riparian areas, including fecal deposition from wildlife, livestock, and invasive species (feral hogs).

Key Element				
(1) Management Measure	**Restore and preserve riparian zones to protect water quality.**			
(2) Potential Load Reduction (cfu/day)	6.64×10^{11} cfu/day	Estimated sum of load reductions from all programs and activities described for Measure 2.	Appendix C includes load reduction estimate calculations.	
(3) Technical and Financial Assistance Needed	Technical Natural resource management and technical expertise is needed from the partner agencies to landowners in the watershed.	Financial The costs depend on the goals for the property, the size of the management area, the existing condition of the property, and the plan that is collaboratively developed with the various resource agencies.	Cost-share resources are needed for landowners.	Grant funding for various programs.
(4) Education Component	Presentations to SWCD	Landowner workshop	Lone Star Healthy Streams and Feral Hog curricula and publications.	AgriLife Extension: various educational programs. Landowner educational field days.
(5) Schedule of Implementation	Year One: Interested landowners contact appropriate agency to participate. Agencies work with landowners to develop plans; possible landowner workshop. Begin feral hog removal program and distribute educational materials. Implement other projects in plan as funding allows.	Year Two, Three, and Four: Partners continue to work with landowners; educational field days as needed; implement other projects listed in plan as funding allows.	Year Five: Partners evaluate and make adjustments.	
(6) Interim, Measurable Milestones	Identification of interested landowners to participate in projects. WQMP or conservation plans developed.	Landowners participating in programs. Removal of feral hogs.	Completion of landowner educational field days. Educational programs completed.	Riparian land designated as public land or preserve.
(7) Progress Indicators	A reduction in *E. coli* concentrations in AUs where undeveloped land exists in the riparian corridor.			
(8) Monitoring Component	LCRA and TCEQ approved QAPP routine water quality monitoring and other sources of data including COA, the CRWN, and other affiliated citizen monitoring efforts.			
(9) Responsible Organization	TSSWCB, NRCS, SWCD, LCRA Creekside Conservation-work with landowners through WQMPs.	USFWS, TPWD -work with interested landowners. TWS – Feral Hog Abatement Program TPL–fundraising for land acquisition.	City of Pflugerville –street sweeping, land acquisition as funding allows. AgriLife Extension-various educational programs.	TCEQ hosts annual meetings.

Management Measure 3.0

Determine the effectiveness of retrofitting existing storm-water detention basins to perform as water quality facilities to reduce bacteria concentrations.

The purpose of this management measure is to reduce bacteria concentrations from urban nonpoint source runoff by retrofitting existing storm-water detention basins to water quality facilities without compromising the detention function of the facilities. Depending on funding, the Center for Research in Water Resources (CRWR) at the University of Texas at Austin will implement this measure through the following specific tasks.

- Two storm-water detention facilities have been preliminarily identified within the City of Pflugerville.
- Design the inflow and outflow structures for the retrofit.
- Prepare monitoring plan and program.
- Obtain appropriate local permits.
- Secure equipment for converting existing storm-water detention basins to water quality facilities.
- Convert inflow and outflow structures.
- Install automated controls and monitoring equipment.
- Perform study on retrofitted facilities.
- Prepare report of results.
- If desired by local authorities, remove the equipment and restore the detention basins to pre-study conditions.

In 2006, the CRWR completed a similar study measuring the effectiveness of modifying a detention basin with automated controls to provide batch treatment of storm water runoff. The results of their study were published in the journal *Water Environment Research* in an article titled *Water Quality Performance of a Batch-Type Storm water Detention Basin (*Middleton & Barrett 2008). This earlier study concluded that adding automated controls to provide batch treatment removed total suspended solids and other parameters more effectively than conventional extended detention basins. This proposed study will focus on bacteria removal.

Partners will host an education/demonstration workshop and field tour with stakeholders and developers near the end of the monitoring period to enhance the understanding of retrofitting detention ponds with automated controls to address urban nonpoint source runoff.

Responsible Parties and Funding

- CRWR at the University of Texas at Austin
- TCEQ - potential CWA 319(h) Nonpoint Source Grant Program Funding
- City of Pflugerville

To fund this study over the next 4 years, CRWR submitted a grant proposal to TCEQ's 319 Nonpoint Source Program in December 2009. Project partners provided support for the grant project; including the City of Pflugerville, which provided matching funds by cleaning two detention facilities to be used as part of the grant.

Measurable Milestones

In Year One, contingent on funding, CRWR secures two detention facilities and appropriate permits. The City of Pflugerville cleans-out identified ponds. CRWR designs the retrofit and converts the structures. All involved stakeholders will provide annual updates at the TCEQ hosted stakeholder meeting in year one and the remaining years of the project.

In Year Two, CRWR monitors ponds during storm events. Partners host an education workshop/field tour.

In Year Three, CRWR analyzes data and prepares a report.

In Year Four, the final report is published and stakeholders and TCEQ review the final report to assess the extent this management measure should be implemented throughout the Gilleland Creek watershed.

In Year Five, partners will evaluate the effectiveness of implementing this management measure in achieving the water quality goals of the TMDL and make appropriate adjustments to specific strategies and technical and financial assistance.

Table 5 provides additional details for Management Measure 3.0. Appendix A provides the schedule of implementation.

Table 5. Storm Water Management Measure Summary

Causes and Sources: Storm water runoff from developed urbanized areas

Key Elements

(1) Management Measures	**Determine the effectiveness of retrofitting storm water detention basins to water quality facilities to reduce bacteria concentration through the following:** • Install automated controls at approximately storm water detention basins and monitor inflow and outflow with and without controls • Monitor new water quality facilities and/or use existing studies to determine effectiveness of managing bacteria			
(2) Potential Load Reduction (cfu/day)	Possible bacteria removal ranging from 50 – 90 percent.	Appendix C provides additional information on estimated bacteria load reduction values.		
(3) Technical and Financial Assistance Needed	Technical assistance from the CRWR. Estimated cost is $216,000; could be obtained through a grant.			
(4) Education Component	Detention pond Retrofit/ Educational workshops for developers.	Existing educational materials on storm water management available on LCRA and EPA websites.	Status updates through TCEQ hosted annual stakeholder meeting.	
(5) Schedule of Implementation	Year One: CRWR applies for grant. CRWR secures two detention facilities and permits. City of Pflugerville cleans out identified ponds. CRWR designs retrofit and converts structures.	Year Two: CRWR monitors ponds during storm events. Workshop/field tour completed.	Year Three: CRWR analyzes data and prepares report.	Year Four: Report published; stakeholders and TCEQ review results. Year Five: Partners evaluate and make adjustments.
(6) Interim, Measurable Milestones	Two storm-water detention basins are successfully retrofitted with automated controls.	10 storm events are monitored at each pond.	Sufficient data collected to make determination on effectiveness of the use of automated controls in reducing bacteria concentration.	Workshop completed.
(7) Progress Indicators	A reduction in E. coli concentrations in the outfalls of the two ponds retrofitted with automated controls			
(8) Monitoring Component	LCRA and TCEQ approved QAPP routine water quality monitoring.	Other sources of data including COA, the CRWN, and other affiliated citizen-monitoring efforts.	Project specific monitoring-CRWR monitors ponds during storm events.	
(9) Responsible Organization	CRWR: Manage and implement the work. City of Pflugerville: clean out identified storm water ponds for project.	COA, City of Pflugerville, City of Round Rock, and Travis County will partner to develop workshop for developers to discuss results and or progress of the study.	TCEQ hosts annual stakeholder meeting.	

Management Measure 4.0

Partners coordinate to develop a general campaign to raise public awareness of unregulated contributions of bacteria pollution, specifically pet waste.

The Education and Outreach Workgroup identified and prioritized educational activities for all Gilleland Creek I-Plan Management Measures. These are addressed in each management measure. This section reviews the current shared resources of the stakeholders and past educational activities. It also describes the watershed-wide public education campaign to inform citizens about the significance of dog excrement as a source of bacteria source and ways to manage it.

Shared Stakeholder Resources

Several of the MS4 permit holders, including City of Pflugerville, City of Round Rock, COA, and Travis County, share many of the same educational themes and outreach objectives as the Gilleland Creek I-Plan and as a result, stakeholders will collaborate with each other to ensure consistency and will share resources to maximize limited education and outreach budgets. Education components offered by the major jurisdictions in the watershed are listed below.

The following entities have existing programs and tools, which are specific to their own jurisdiction, but available to any jurisdiction:

Travis County

Watershed signs, OSSFs educational brochure, construction site storm water control brochures, Travis County cable channel 17, and Storm Water Management Program website.

City of Pflugerville

Storm water fact sheets construction site storm-water control brochures, City's local channel 10 station, Drop-by-Drop Landscape Rebate, and storm-drain marking program.

COA

Grow Green Program, educational brochures on water quality and nonpoint source education, Clean Creeks Campaign, storm drain marking, and Green Neighbor program.

City of Round Rock

Storm water brochures, utility bill inserts, public service announcements, storm water quality webpage, event participation, classroom education about storm water, partnership program, gardening and lawn care education, and storm drain markers.

All of the above programs for the General Public Awareness Campaign will be provided as part of each entity's MS4 Storm Water Management Program.

Measurable Milestones

The Cities of Pflugerville and Round Rock, and Travis County will implement appropriate public awareness campaigns according to the schedules in their Storm Water Management

Programs in their Phase II MS4 permits. The COA will implement according to the schedules in their Phase I permit.

Educational activities completed or in progress:

- The Education and Outreach work group identified outreach components for all of the Gilleland Creek watershed, this section details activities completed or in progress.

- The LCRA's CRWN trained eight citizens in 2008 to collect water quality data in the Gilleland Creek watershed. Given that many of the citizen monitors live in the City of Pflugerville and are interested in the water quality of their community, all of the volunteer monitor locations are located in Pflugerville.

- On December 3, 2008, Texas Stream Team along with LCRA conducted an intensive survey on 111 sites from Gilleland Creek, Gilleland West Fork, Harris Branch, Decker Creek, and Elm Creek to examine the spatial distribution and concentrations of *E. coli* bacteria in the watershed. This monitoring event utilized the work from 24 volunteers and staff from Texas Stream Team, LCRA, the COA, the City of Pflugerville, the Texas Department of Transportation, and the TCEQ. The main goals of this activity were to:

  - enhance stakeholders' and the general public's knowledge of watershed functions and the dynamic nature of bacteria;
  - build support and awareness for the Gilleland Creek TMDL project; and
  - to increase general understanding of *E. coli* levels within the watershed. The *Final Data Analysis Report for the Gilleland Creek Intensive Bacteria Survey* is available at the Texas Stream Team website <http://txstreatteam.rivers.txstate.edu/ Data/Data-Reports-html>.

- A landowner's workshop hosted by LCRA and other partners was held in October 2008. This was a free workshop, which provided information on land management practices for soil and water conservation. Interested participants learned about the Gilleland Creek watershed, stream process / mechanics, benefits of riparian areas, working in and around streams and funding resources to aid in putting these conservation practices in place.

- In support of implementing the Gilleland Creek TMDL, a Texas Watershed Steward workshop was held March 2008 in Pflugerville. Sponsored by TSSWCB, Texas AgriLife Extension Service, LCRA, and other partners, this workshop discussed what it is to be a watershed steward, sources of water pollution, managing urban and rural lands using BMPs and how to get involved in protecting and enhancing their community water resources. There were nearly 90 participants including concerned citizens, landowners, local businesses, and professionals in a variety of fields. The Texas Watershed Steward Program was developed by AgriLife Extension through CWA 319(h) nonpoint source grants from the

TSSWCB. More information about the Texas Watershed Steward Program is available at <http://tws.tamu.edu>.

Pet Waste Campaign

For the pet waste campaign component of this management measure, stakeholders will conduct a watershed-wide public education campaign to inform citizens about the significance of pet waste as a source of bacteria and ways to manage it. Educational components include:

- Park signs and yard signs, which will target the pet waste problem. Potential parks include City of Pflugerville parks and Travis County Northeast Metropolitan Park.
- Installation of pet waste collection stations/receptacles and mutt mitt/doggie bag dispensers.

Park users will be surveyed before and after campaign to gage effectiveness.

- Citizens involved as pet waste patrols and volunteer water quality monitors.
- Educational brochures will be made available to the public.
- Stakeholders who have educational brochures will make them available for use in the entire watershed. The audience will be reached by placing promotional materials at veterinary offices, animal shelters, pet stores or including information in utility bills.

Responsible Entities and Funding

- COA – Scoop the Poop campaign.
- City of Pflugerville – Brochures, including proper pet waste management, and doggie waste bags every quarter of a mile along walking trails bordering Gilleland Creek.
- Travis County - Pet waste collection stations at the Travis County Northeast Metropolitan Park.
- TCEQ.

The pet waste campaign partners will seek financial assistance to cover the costs of the surveys of park users, additional pet waste containers, signs, mutt mitt dispensers, costs for brochures, public service announcements, radio spots, and promotional items such as doggie bag leash holders. For example, the City of Kyle received a TCEQ CWA 319(h) Nonpoint Source Grant to install pet waste containers, signs, mutt mitt dispensers, and educational programming in Plum Creek.

LCRA will continue to provide support for the CRWN volunteer monitors in the watershed. This support includes supplying testing materials for bacteria samples, database management for data collection, and coordinating volunteer efforts.

Measurable Milestones

In Year One, the stakeholders will inventory resources and secure any necessary additional funding. CRWN volunteers will collect bacteria samples from the watershed. With assistance from volunteers, partners will survey park users to determine the percentage of park goers that properly dispose of pet waste and review the results of the survey. In addition, stakeholders will increase mutt mitt containers, waste receptacles, and signage at parks.

In Year Two, stakeholders will distribute educational information using available resources and continue to increase mutt mitt containers, waste receptacles, and signage at parks. Additional Texas Watershed Steward workshops may be warranted in years two and beyond.

In Year Three, volunteers will survey park users to determine the change in percentage of park goers that properly dispose of pet waste.

In Years Four and Five, partners will evaluate the effectiveness of implementing this management measure in achieving the water quality goals and make appropriate adjustments.

Table 6 provides additional details about Management Measure 4.0. Appendix A provides the schedule of implementation.

Table 6. Education and Outreach (Pet Waste) Management Measure Summary

Causes and Sources: Nonpoint sources of bacteria found in local waterways caused by the improper disposal of pet waste.

Key Elements

(1) Management Measure	**Coordinate with partners to develop a general campaign to raise public awareness of nonpoint-sources of bacteria pollution, specifically pet waste.**			
(2) Potential Load Reduction (cfu/day)	1.02×10^{12} cfu/day	Estimated using the number of households, estimation of dogs per household, percentage of people who typically do not pick-up their dog's waste, average daily fecal coliform bacteria production per dog, and an estimation of yearly high flow.	Appendix C provides additional information.	
(3) Technical and Financial Assistance Needed	Partners pursue grant funding to cover additional signs, mutt mitt containers, trash receptacles, publications, and giveaways.	Technical assistance: • To conduct the survey of park users , • To determine the effectiveness of the pet waste campaign by reviewing volunteer monitoring efforts and results from the survey of park users.		
(4) Education Component	Park and yard signs will be placed in the surrounding neighborhoods.	Educational brochures will be made available at veterinary offices, animal shelters, pet and grocery stores, and through inserts in utility bills.	Citizens could be involved as pet waste patrols and volunteer water quality monitors.	Status updates through TCEQ-hosted annual stakeholder meeting.
(5) Schedule of Implementation	Year One: • Volunteer water monitoring during the project. • Survey park user's pet waste habits. • Seek additional funding. • Review survey results and construct strategy. • Increase mutt mitt containers, waste receptacles, and signage at pilot parks.	Year Two: Stakeholders will distribute educational information using available resources and continue to increase mutt mitt containers, waste receptacles, and signage at parks.	Year Three: Survey park users Evaluate program.	Years Four and Five: Determine next strategies based on program evaluation.
(6) Interim, Measurable Milestones	Partners submit grant proposals.	Complete survey of park users. Determine campaign communication strategy and level of compliance with proper pet waste disposal.	Number of additional pet waste and trash receptacles provided by grants or partners.	Number of volunteer hours donated by citizens to support campaign.
(7) Progress Indicators	A reduction in *E. coli* concentrations in the four Gilleland Creek AUs.	Number of mutt mitts dispensed will be used to calculate the reduction in pet waste contributions.		
(8) Monitoring Component	LCRA- and TCEQ -approved QAPP routine water quality monitoring.	Other sources of data including COA, the CRWN, and other affiliated citizen-monitoring efforts.	Survey of park users to assess adoption of pet waste BMPs.	
(9) Responsible Organization	LCRA will continue to provide support for the CRWN volunteer monitors in the watershed.	Partners include: • Travis County, • COA, • City of Pflugerville.	These partners will collaborate to: • submit grant proposals, • review survey results and identify parks, • contribute existing resources, • provide additional implementation of mutt mitt containers.	TCEQ hosts annual stakeholder meeting.

Management Measure 5.0

Develop and adopt equivalent water-quality ordinances between government jurisdictions.

At the time of the Gilleland Creek TMDL study, more than 60 percent of the watershed was classified as undeveloped land. However, stakeholders identified that these lands will soon be developed because of planned or anticipated growth associated with the new State Highway 130. The Cities of Austin, Manor, Pflugerville, and Round Rock have the authority to review and approve development within their full-purpose, limited-purpose, and extraterritorial jurisdictions (ETJs).

Within each City's ETJ boundary, (the COA has a two- and five-mile ETJ boundary), the Cities have the authority to review and approve subdivisions and site plans. Travis County also has authority outside a municipality's corporate limits, but within the ETJ, to approve developments. It is through development review that the Cities and County are able to implement water quality ordinances. Within each City's full-purpose jurisdiction, they also have the authority to control land use via zoning. The COA also has zoning authority for land use within its limited-purpose jurisdiction.

The purpose of this management measure is to prevent further degradation of water quality by limiting future pollutant loading in the Gilleland Creek watershed. Stakeholders developed the following goal for this management measure:

Limit future bacteria loads from new development and redevelopment by:

1) providing hydrologic control and treatment of post development runoff;
2) protecting and preserving natural pollutant control systems (riparian buffers and wetlands); and
3) directing the placement of wastewater infrastructure away from waterways.

Considering the potential for development, stakeholders created a Water Quality Ordinance Framework. The Framework includes several criteria: stream buffers, water quality and stream bank erosion-control requirements, wastewater lines, wetlands, and associated variances. The framework is included in Appendix D. The provisions include descriptions of the current regulations for each of the above stated criteria and include descriptions of alternatives to meet the goal of this management measure. The framework merely represents the recommendations for provisions for a water quality ordinance by the majority of the workgroup members.

If adopted by the various jurisdictions, this framework would be implemented through ordinances applied to new development or redevelopment projects in accordance with each jurisdiction's regulations. The approval and implementation of the provisions of the Gilleland Creek Watershed Water Quality Ordinance Framework is the responsibility of the governing bodies for each jurisdiction. Each municipality's ordinance will also comply with the Texas Water Code, Title 2, Subtitle D, Chapter 26, Section 26.180 Nonpoint Source Water Pollution Control Programs of Certain Municipalities. This ordinance, according to state law, will not apply to any project that already is approved by the jurisdictions but is not yet developed.

The Education and Outreach Work Group identified workshops for local officials as their highest priority educational activity for the Gilleland Creek Plan. The purpose of these workshops will be to educate local officials and leaders on overall water quality topics such as the nature and function of watersheds, the current bacteria impairment, potential impairments, and strategies for watershed protection. Emphasis will be on educating leaders on the relationship between land use and natural resource protection, with a focus on water resources. These workshops would be based on the Texas AgriLife Extension Service Texas Watershed Stewards Program and the University of Connecticut Cooperative Extension System Nonpoint Education for Municipal Officials Project.

Responsible Parties and Funding

- City of Pflugerville
- City of Round Rock
- COA
- Travis County

The City of Pflugerville may pursue grant funding to assist with the development of their SWMP, including adopting and implementing an ordinance. The City of Pflugerville will also evaluate the appropriateness of a Drainage Utility District to provide a source for funding. The Cities of Round Rock and Austin, and Travis County will use existing resources to develop, adopt, and implement their water quality ordinances.

Measurable Milestones

In Year One, responsible entities explore the feasibility of a water quality ordinance based on the provisions of the Gilleland Creek Watershed Water Quality Ordinance Framework (Appendix D). Responsible entities will begin their processes toward development and adoption, which could include the establishment of a stakeholder workgroup through the authority of each jurisdiction to obtain input from affected individuals.

In Year Two, responsible entities will present their water quality ordinance and seek approval from their appointed officials, such as environmental boards and planning commissions. Responsible entities conduct workshop(s) for the development community and elected officials.

In Year Three, responsible entities present their ordinance and seek approval from their elected officials.

In Year Four, responsible entities will implement their ordinance after it becomes law and develop a recognition program to highlight successful developments.

In Year Five, partners will evaluate the effectiveness of implementing this management measure in achieving the water quality goals of the TMDL and make appropriate adjustments to specific strategies and technical and financial assistance.

Table 7 provides additional details for Management Measure 5.0. Appendix A provides the schedule of implementation.

Table 7. Ordinance and Planning Management Measure Summary

Causes and Sources: Nonpoint source runoff from new development and redevelopment

Key Elements

(1) Management Measures	**Develop and adopt equivalent water-quality ordinances between government jurisdictions.**			
(2) Potential Load Reduction (cfu/day)	Impacts from the proposed ordinance on future development cannot be quantified until the details of the water quality ordinances are finalized by each government jurisdiction.	Appendix C provides additional information on load reductions.		
(3) Technical and Financial Assistance Needed	Stakeholders support each other by their participation in the I-Plan review process and through personal communications.	The Cities of Pflugerville, Round Rock, and Austin, along with Travis County, will use existing resources for ordinance development or seek grant funding as needed.	The Cities of Pflugerville, Round Rock, and Austin, along with Travis County, will evaluate the appropriateness of a Drainage Utility district as a source of funding.	
(4) Education Component	Workshop to educate local officials and leaders on overall water quality topics.	Educational workshops for elected officials and developers about requirements of the Watershed Ordinance Framework.	Recognition program to highlight successful developments.	
(5) Schedule of Implementation	Year One: Explore feasibility of a water quality ordinance. Begin process to develop and adopt ordinance.	Year Two: Present ordinance to seek approval from appointed officials and conduct workshops for elected officials and development community.	Year Three: Present ordinance and seek approval from elected officials.	Year Four: Implement Ordinance and develop recognition program. Year Five: Review and make adjustments.
(6) Interim, Measurable Milestones	COA, Round Rock, Pflugerville, and Travis County explore development of water-quality ordinances to be implemented in the watershed.	Initiating public review process.	Ordinances consistent with the Framework are adopted by each jurisdiction.	
(7) Progress Indicators	Routine water quality samples collected will not show an increase in bacteria levels that is typical for a watershed where land use is changing from rural to urban.			
(8) Monitoring Component	LCRA- and TCEQ-approved QAPP routine water quality monitoring.	Other sources of data including COA, the CRWN, and other affiliated citizen-monitoring efforts.		
(9) Responsible Organization	Travis County and the municipalities (COA, City of Pflugerville, and City of Round Rock) within the watershed collaborate on development of ordinance and workshop(s).	Travis County and the municipalities within the watershed collaborate on developing individual ordinances and recognition program.	TCEQ hosts annual stakeholder meeting.	

Management Measure 6.0

Conduct annual visual inspection of wastewater collection systems within 100 ft from the centerline of Gilleland Creek and its tributaries.

The WWTFs, existing and proposed, and the operators of the Dessau Fountain Estates[9] collection system have committed to perform visual inspections of their wastewater collection systems that are within 100 ft from the centerline of Gilleland Creek and its tributaries. The facilities that have agreed to inspect the wastewater collection systems include: COA's Harris Branch, Wild Horse Ranch, Whisper Valley and Harris Ridge (formerly Dessau Utilities); City of Pflugerville; Windermere Utility Company; and Dessau Fountain Estates. In the Gilleland Creek Watershed, the City of Pflugerville has 68 miles of collection lines; the COA has 46.1 miles; Windermere Utility has 45.4 miles, and Dessau Fountain Estates has an estimated 40 miles.

WWTF staff will visually inspect their collection system and look for failure areas, such as highly eroded areas, exposed pipe or excess green vegetation. The entities will use the same form to document the inspection of wastewater collection-line systems. After the initial inspection, each utility will determine its future inspection work (opening manholes, smoke testing, closed circuit televising, or dye testing) based on the severity of findings. The facilities have agreed to make and document repairs to the collection system if problems are encountered. If major and costly repairs are required, these will be performed within two years. This two-year window will provide the utility the necessary time to determine funding for the repairs. Smaller repairs will be completed as soon as resources allow.

Supplementary training or outside technical assistance is not required to perform the above ground visual inspection of the wastewater collection systems. With the exception of the COA, which operates several facilities in the watershed, the treatment facilities will work independently to the complete the visual inspections. Utility staff will reference available construction drawings, GIS maps and rely on operator experience to identify collection system components that are within 100 ft of the centerline of Gilleland Creek. Operators will walk the wastewater collection lines, document the inspection, make necessary repairs, and apprise stakeholders of the project status.

Information about the visual inspections by WWTF operators may be included in educational inserts or as separate items that are mailed to wastewater utility customers. The water quality benefits of the inspections and repairs of failing wastewater collection systems can be explained in these inserts or flyers.

The TMDL described overflows from sanitary collection systems as usually infrequent. Between 1992 and 2002, City of Austin staff investigated 19 incidents in the Gilleland Creek watershed. Of these, seven were identified as potentially influencing bacteria concentrations. Several WWTFs in the watershed have expressed interest in joining TCEQ's Sanitary Sewer Overflow (SSO) Initiative. The intent of TCEQ's SSO Initiative is to optimize the collection system performance and minimize SSOs. This program is

[9] In 2009, Dessau Fountain Estates began routing the influent wastewater to the City of Austin's Walnut Creek wastewater facility. Dessau Fountain Estates continues to maintain the wastewater collection system.

voluntary and requires wastewater collection systems to enter into an agreement with TCEQ that includes conducting a detailed sanitary sewer evaluation survey, developing a plan to address SSOs, and identifies corrective measures and milestones for completion.

Responsible Parties and Funding

- TCEQ
- Windermere Utility Company Inc., Southwest Water Corporation
- Dessau Fountain Estates LLC, Severn Trent Environmental Services[8]
- City of Pflugerville, Utilities Department
- Austin Water Utility

The combined estimated cost for the existing WWTFs collection systems and the Dessau Fountain Estates collection system to visually inspect their collection lines within 100 ft of the centerline of the creek and its tributaries is $40,320 per year and $201,600 over a 5-year period. Those collection systems that require maintenance or repair due to integrity failure or imminent structural failure will be corrected. Routine inspection and maintenance activities are budgeted as part of regular operation and maintenance activities. Small-scale repairs will be made as soon as possible after discovery. If major and costly repairs are required, these will be performed within two years. The cost of inspection and repair of failing collection system will be borne by the utility ratepayers.

Measurable Milestones

In Year One, the WWTFs will gather information to help identify the location of wastewater collection systems within 100 ft of Gilleland Creek and its tributaries, begin annual visual inspection of wastewater collection systems in proximity to Gilleland Creek and its tributaries and will make repairs as needed as a result of the visual inspections. Collection systems that are interested join TCEQ's SSO initiative.

In Year Two, Three, Four, and Five, the WWTFs will report the previous year's visual inspection results to TCEQ TMDL staff and will continue annual visual inspections. GPS coordinates of collection systems are added to available GIS layers maintained by I-Plan partners. Entities that are interested join TCEQ's SSO initiative. Both, the TCEQ and the WWTFs will report the results of the visual inspections to stakeholders at TCEQ hosted annual status update meetings. Inserts or flyers will be distributed to utility customers about the benefits of the inspections.

In Year Five, partners will evaluate the effectiveness of implementing this management measure in achieving the water quality goals of the TMDL and make appropriate adjustments to specific strategies and technical and financial assistance.

Table 8 provides additional details for Management Measure 6.0. Appendix A provides a schedule of implementation.

Table 8. Wastewater Treatment Facility Management Measures Summary

Causes and Sources: Wastewater collection system failures

Key Elements

(1) Management Measures	**Identify and repair failing wastewater collection systems.**			
(2) Potential Load Reduction (cfu/day)	Impacts from the proposed visual inspection cannot be quantified without further, more rigorous analysis.	Appendix C provides additional information.		
(3) Technical and Financial Assistance Needed	Technical: WWTF will use existing resources.	Financial: The estimated cost for all existing facility systems to visually inspect their collection lines is $40,320 per year and $201,600 over a 5-year period.	Existing resources will be used.	
(4) Education Component	Inserts into utility bills or separate flyers.	Status updates through TCEQ hosted annual stakeholder meeting.		
(5) Schedule of Implementation	Year One: WWTF gather information; begin inspections and repairs. WWTFs join TCEQ's SSO Initiative if interested.	Year Two, Three, Four, and Five: • Continue inspections and report yearly results. • WWTFs join TCEQ's SSO Initiative if interested. • WWTFs distribute educational inserts or flyers to utility customers.	Year Five: Partners will review implementation and make adjustments.	
(6) Interim, Measurable Milestones	Number of collection system sections inspected increases.	Number of collection systems joining TCEQ's SSO Initiative.	Decrease in SSOs, or failures are repaired quickly. Televise sections of collection systems if resources allow.	Add GPS coordinates of waste water lines to GIS layers.
(7) Progress Indicators	A reduction in *E. coli* concentrations in the 4 AUs of Gilleland Creek.	Visual inspections of collection systems do not identify any facilities discharging wastewater to the creek.		
(8) Monitoring Component	LCRA- and TCEQ-approved QAPP routine water quality monitoring.	Other sources of data including COA, the CRWN, and other affiliated citizen-monitoring efforts.		
(9) Responsible Organization	City of Pflugerville, COA, Windermere Utilities, and Dessau Fountain Estates perform inspections, repairs as needed, and report results.	City of Pflugerville, COA, Windermere Utilities, and Dessau Fountain Estates add GPS coordinates to GIS layers and distribute educational flyers as needed.	TCEQ hosts annual stakeholder meeting.	

Control Action 1.0

Monitor and report E. coli concentrations from WWTF effluent.

In November 2009, TCEQ's Commission approved Rule Project No. 2009-005-309-PR. The rulemaking adds bacteria limits for either *E. coli* for fresh water discharges or *Enterococci* for saltwater discharges to Texas Pollutant Discharge Elimination System (TPDES) domestic permits in Title 30 Administrative Code Chapter 309 and sets the frequency of testing for bacteria in Chapter 319. In 2009, TCEQ renewed and amended the discharge permits for the facilities identified in Table 9 to include *E. coli* monitoring and effluent limits. Prior to the permit renewal, the TCEQ required only the maintenance of a chlorine residual for the facilities that chlorinate for disinfection.

At the date of this report, the two facilities and the one proposed facility that use ultraviolet disinfection monitor for *E.coli* on a daily basis. All WWTFs in the watershed will monitor according to permit provisions. Monitoring and reporting through Discharge Monitoring Reports (DMRs) will continue as required by the permit.

TCEQ is responsible for the enforcement of compliance with permits. The goal of the monitoring is to ensure that the facilities' effluent has concentrations less than the limits stated in each facility's permit. If monitoring results indicate concentrations approaching or exceeding the limit set in the facility's permit, then the facilities will make necessary operational changes to reduce the bacteria concentrations as required by the facility's permit.

Table 9. Wastewater Treatment Facility Permit 2009 Revisions[10]

Facility Name	Permit Number	Permitted Flow (MGD)	Disinfection Method	Effluent Limits	Frequency of Monitoring
City of Pflugerville	11845-002	5.3	Chlorination/ dechlorination	126cfu/100mL daily average; 394 single grab	1/week
Windermere Utility Company	11931-001	2.0	Ultraviolet	120cfu/100mL daily average; 374 single grab	7/week
Dessau Fountains Estate	12733-001	0.15	Chlorination	Expired permit.	1/week
COA Harris Branch	13318-001	2.0	Chlorination/ dechlorination	120cfu/100mL daily average; 374 daily maximum	1/week
COA Wild Horse Ranch	10543-013	0.99	Ultraviolet	120cfu/100mL daily average; 374 daily maximum	7/week
COA Harris Ridge, (formerly Dessau Utilities)	12971-001	0.5	Chlorine	120cfu/100mL daily average; 374 daily maximum	1/week
COA Whisper Valley	10543-014	3.0	Ultraviolet	126cfu/100mL daily average; 394 daily maximum	7/week

[10] Dessau Fountains Estate canceled its permit in 2009; it is listed for reference only. COA Whisper Valley is a permitted facility planned to be built. The Windermere Utility Company permit was recently revised to 120cfu/100ml. Both the City of Pflugerville and COA Whisper Valley will be revised to 120cfu/100mL when renewed.

Responsible Parties and Funding

- TCEQ
- Windermere Utility Company Inc., Southwest Water Corporation
- Dessau Fountain Estates LLC, Severn Trent Environmental Services
- City of Pflugerville, Utilities Department
- Austin Water Utility

Measurable Milestones

In 2009, the TCEQ included an *E. coli* monitoring requirement in the permits for the existing WWTFs and the one proposed facility shown in this plan.

In Year One, all WWTFs will continue to monitor and report *E. coli* bacteria data as required by individual wastewater permits and will make appropriate adjustments to operations, if *E. coli* concentrations warrant adjustments to decrease concentrations. The TCEQ TMDL team and responsible entities will review, summarize, and present monitoring data to the stakeholders.

In Years Two, Three, Four, and Five, WWTFs will continue the activities of the previous years.

Table 10 provides additional details for control action 1.0. Appendix A provides a schedule of implementation.

Table 10. Wastewater Treatment Facilities Control Action Summary

Causes and Sources: Wastewater treatment facility effluent

Key Elements

(1) Management Measures	**Monitor and report effluent *E. coli* concentrations at existing and new WWTFs**			
(2) Potential Load Reduction (cfu/day)	6.35 x10^{10} cfu/day	Load reductions calculated based on repairs to problem systems or operational changes.	Appendix C provides additional information.	
(3) Technical and Financial Assistance Needed	Technical: WWTF will rely on existing resources.	Financial: WWTF will rely on existing resources.		
(4) Education Component	Status updates through TCEQ hosted annual stakeholder meeting.			
(5) Schedule of Implementation	2009: Permits updated to contain *E. coli* monitoring.	Year One: Begin monitoring and reporting *E. coli*. Make operational adjustments, and summarize and present data to stakeholders.	Years Two, Three Four, Five: Same as Year One.	
(6) Interim, Measurable Milestones	All WWTFs are monitoring and reporting within permit limits.	Operational changes are initiated if values exceed permit limits.		
(7) Progress Indicators	A reduction in *E. coli* concentrations in the 4 AUs of Gilleland Creek.	All wastewater treatment facilities have *E. coli* concentrations less than permit limits.		
(8) Monitoring Component	LCRA- and TCEQ-approved QAPP routine water quality monitoring.	Other sources of data including COA and the CRWN.	Monitoring data from WWTFs.	
(9) Responsible Organization	City of Pflugerville, Dessau Fountains Estate, COA, and Windermere Utilities.	TCEQ hosts annual stakeholder meeting, and enforces compliance.		

Sustainability

The TCEQ and the stakeholders for the TMDL implementation projects will periodically assess the results of the planned activities and other sources of information to evaluate the efficiency of the I-Plan. The stakeholders will evaluate several factors, such as the pace of implementation, the effectiveness of BMPs, load reductions, and progress toward meeting water quality standards. The TCEQ will document the results of these evaluations and the rationale for maintaining or revising elements of the I-Plan, and will present them as summarized in the following section.

The TCEQ and stakeholders will track the progress of the I-Plan using both implementation milestones and water quality indicators. These terms are defined as:

- **Water Quality Indicator** – A measure of water quality conditions for comparison to pre-existing conditions, constituent loadings, and water quality standards.
- **Implementation Milestones** – A measure of administrative actions undertaken to effect an improvement in water quality.

Water Quality Indicators

Water quality monitoring staff of the LCRA, COA, and TCEQ Region 11 will monitor the status of water quality during implementation. The following summary describes routine water-quality monitoring activities for each of the four AUs in the Gilleland Creek Watershed. The LCRA already monitors in AUs 1 and 2 and proposes to begin monitoring in AU 3. The TCEQ monitors in AU 4. The purpose of this monitoring is to ensure that enough *E.coli* data is collected in each of the four AUs to determine water quality standards attainment throughout the watershed.

This element of the I-Plan also includes a summary of the COA's monitoring activities and the CRWN volunteer water-quality monitoring program.

Assessment Unit 1 (AU 1): From the Colorado River upstream to Taylor Lane

Site 17257, Gilleland Creek at FM 969 is downstream of Webberville Road/FM 969, east of Austin. This site will be monitored on a bimonthly basis (six times per year). This is a current and historical site monitored by LCRA and will provide quality assured data for **AU 1.**

Assessment Unit 2 (AU 2): From Taylor Lane upstream to Old Highway 20

Site 12235, Gilleland Creek at FM 973 south of the City of Manor will be monitored on a bimonthly basis (six times per year). This is a current and historical site monitored by LCRA, and will provide quality assured data for **AU 2**.

Assessment Unit 3 (AU 3): From Old Highway 20 to Cameron Road

Site 12236, Gilleland Creek at US 290 north of Manor has been monitored historically and will potentially be continued by LCRA. Monitoring will be bimonthly (six times per year) starting in TCEQ's FY 2010. This site should provide quality assured data for **AU 3**.

Assessment Unit 4 (AU 4): From Cameron Road to the spring source

Site 20474, Gilleland Creek at Northeast Metropolitan Park, southeast of Pflugerville (at the low water crossing 1.559 kilometers north, 302 meters west to the intersection of Killingsworth Lane and Cameron Road) is a newly established site which TCEQ began monitoring in 2009. It will be monitored quarterly (four times per year). It will provide quality assured data for **AU 4**.

Another source of data that may be used in the assessment of Gilleland Creek is monitoring by the COA. The COA may submit monitoring results under the quality assurance of the LCRA Clean Rivers Programs Quality Assurance Project Plan. At the date of this report, Austin's *E.coli* data is analyzed at an in-house lab that is not approved under the National Environmental Laboratory Accreditation Conference (NELAC). Therefore, the COA's *E. coli* data cannot be used for assessment purposes. The data will be used by the COA to calculate their Environmental Integrity Index, which is a tool developed to monitor and assess the ecological integrity of Austin watersheds. The COA collects water chemistry data quarterly and biological and habitat surveys annually in the summer.

Monitoring may also be conducted by CRWN and Texas Stream Team volunteers. Certified CRWN volunteer water quality monitors will submit data to LCRA or Texas Stream Team. Possible sites include Gilleland Creek at Edgemere, Gilleland Creek below Bohl Park (12239), Gilleland Creek at Picadilly Lane (18763), Gilleland Creek at lower end of Gilleland Park at Railroad, and Gilleland Creek at Grand Avenue Parkway. CRWN data is not quality-assured by the TCEQ and will not be used for assessment purposes. Since volunteer monitoring data provides more frequently collected data from more locations, it might be utilized to identify problem areas that can then be addressed by professional monitoring data collection efforts or to help gauge the success of implementation efforts.

The TCEQ will assess Gilleland Creek every two years as part of updating the Integrated Report. Revisions to the Texas Surface Water Quality Standards criteria for contact recreation were adopted by TCEQ in the summer of 2010 and were under review by EPA at the time this plan was written. If the standards are revised or changes in the creek's water quality are observed, this plan will be modified. This management strategy allows stakeholders to learn and adapt the plan as progress is made. The ultimate goal is for Gilleland Creek's four AUs to have sufficiently low *E. coli* loading so that it meets water quality standards for contact recreation.

If sufficient reductions in *E. coli* are not observed, the stakeholders will reevaluate the potential sources identified in the TMDL and adapt the I-Plan as appropriate.

Implementation Milestones

Implementation tracking provides information that can be used to determine if progress is being made toward meeting goals of the TMDL. Tracking also allows stakeholders to evaluate actions taken, identify those actions which may not be working, and make any changes that may be necessary to get the plan back on target. Schedules of implementation activities and milestones for this I-Plan are included in Appendix A.

Communication Strategy

Communication is necessary to ensure stakeholders understand the I-Plan and its progress in restoring water quality conditions. The TCEQ will disseminate the information derived from tracking I-Plan activities to interested parties, including watershed stakeholders, state leadership, government agencies, non-governmental organizations, and individuals.

The TCEQ will report results and evaluations from implementation tracking to stakeholders as needed. TCEQ may disseminate information through webpage updates, annual meetings, and periodic e-mail messages. The TMDL Program will summarize all actions taken to address the impairment and will report trends observed in the water quality data collected to track the progress of implementation as needed. Responsible parties are committed to providing appropriate information to the TCEQ to update these progress assessments and communicating information at annual meetings. Regionally, the progress and results of the I-Plan will be reported in annual reports prepared by the LCRA under provisions of the Texas Clean Rivers Program.

In accordance with CWA §319, the state must annually report to USEPA on success in achieving the goals and objectives of the *Texas Nonpoint Source Management Program*, including progress in implementing the NPS portion of TMDLs. The TCEQ and TSSWCB jointly publish *Managing Nonpoint Source Water Pollution in Texas: Annual Report*, which highlights the state's efforts during each fiscal year to collect data, assess water quality, implement projects that reduce or prevent NPS pollution, and educate and involve the public to improve the quality of water resources. Information derived from tracking and review activities of this *I-Plan for One TMDL for Bacteria in Gilleland Creek* will be reported in each annual report. Previously published annual reports are available at <www.tceq.texas.gov/nav/eq/nonpointsrcpgm.html>.

The TCEQ will be responsible for hosting annual meetings for up to the next five years so stakeholders may evaluate their progress. Stakeholders will continue to take part in the annual meetings over the five-year period to evaluate implementation efforts. At the completion of the scheduled I-Plan activities, stakeholders will assemble and evaluate the actions, overall impacts, and results of their implementation efforts.

References

American Veterinary Medical Association. U.S. Pet Ownership Calculator 2007. <www.avma.org/reference/marketstats/ownership.asp>.

Clary, Jane, Jonathan Jones, Ben Urbonas, Marcus Quigley, Eric Strecker, and Todd Wagner. 2008. Can Storm water BMPs Remove Bacteria? New Findings from the International Storm water BMP Database.

EPA, National Pollutant Discharge Elimination System (NPDES) 2009. Urban BMP Performance Tool, Three Keys to BMP Performance – Concentration, Volume, and Total Load. <http://cfpub.epa.gov/npdes/storm water/urbanbmp/bmptopic.cfm>.

EPA 2004. 319 Nonpoint Source Program and Grants Guidelines for States and Territories. <www.epa.gov/fedrgstr/EPA-WATER/2003/October/Day-23/w26755.htm>. Accessed December 28, 2006.

EPA 2001. Protocol for Developing Pathogen TMDLs

EPA 1993. Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters. US EPA, Office of Water. Washington, DC.

HDR Report 2003. Water Quality Study of the Arkansas River, Phase 2 Report.

Lower Colorado River Authority with guidance from the TMDL Storm Water Work Group. September 2008. Gilleland Creek Total Maximum Daily Load for Bacteria Implementation Plan: Water Quality Retrofits Screening Assessment: Can Best Management Practices Manage Bacteria?

LTI 1999. Lower Geddes Pond TMDL Development Approaches. Limno-Tech, Inc

McHarg, M., Baldock, C., Headley, B., Robinson, A. (1995). National People and Pets Survey, a report to the Urban Animal Management Coalition.

Metcalf & Eddy, 3rd edition 1991. Untreated wastewater bacteria concentrations

Middleton, John R., and Michael E. Barrett. Water Quality Performance of a Batch-Type Storm-Water Detention Basin. 2008. Water Environment Research. Volume 80.

Middleton, John R.; Michael E. Barrett, and Joseph Malina. July 2006. "Water Quality Performance of a Batch-Type Storm water Detention Basin," Center for Research in Water Resources, University of Austin.

Reckhow, K. 2007. Adaptive Implementation–Executive Summary. Watershed Management to Meet Water Quality Standards and TMDL, 4th Conference Proceedings. American Society of Agricultural and Biological Engineers, pp 15-17.

TCEQ 2009. Update to the Water Quality Management Plan for the State of Texas April 2009.www.tceq.texas.gov/permitting/water_quality/wq_assessment/assessment/WQ management_updates.html. Online. Retrieved August 2009.

TCEQ 2007. One Total Maximum Daily Load for Bacteria in Gilleland Creek (Segment 1428C).

Thorpe 2003. The Water Line Newsletter. "The Scoop on Poop." Spring 2003, Volume 7, No.2. <www.lmvp.org/Waterline/spring2003/scoop.htm>

U.S. Census Bureau 2000. Decennial Census 2000. www.census.gov. Online. Retrieved August 2006.

Van der Wel, B. 1995. Dog Pollution. The Magazine of the Hydrological Society of South Australia. Volume 2, No. 1.

Wagner, Kevin, & Emily Moench 2009. Texas Water Resources Institute Technical Report No. 347. <http://twri.tamu.edu/reports/2009/tr347.pdf>. Online. Retrieved October 2010.

Appendix A.
I-Plan Matrix

Table A-1. On-Site Sewage Facilities Measures — Implementation Schedule and Tasks

Plan Year	Responsible Parties	Implementation Measure	Implementation Milestones
Year 1			
	Travis County, COA, TCEQ	• Available data mapped and evaluated to identify OSSFs and appropriate authorized agents in the watershed and to create a prioritized list for inspection	• OSSFs and appropriate authorized agents identified • OSSF prioritization schedule complete • map created from current data
	Travis County, COA, TCEQ	• As a group, the authorized agents will inspect up to 10% of highest priority OSSFs.	• # systems inspected • # malfunctioning systems repaired • load reduction based on # of failing systems corrected
	LCRA (in conjunction with Travis County and COA)	• Conduct one workshop for OSSF owners	• # of participants; • # requesting assistance
	Travis County, COA, TCEQ, LCRA	• Provide educational materials to OSSF owners. Three existing LCRA educational booklets are available for distribution by Travis County and COA. COA and Travis County will mail the booklet to OSSF owners with their permits or as a separate, direct mail out or as needed	• # of materials distributed
	Travis County, COA, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ. Status report to include number of OSSFs inspected, and the number of malfunctioning OSSFs repaired or replaced	• # of sustained partners and stakeholders participating • # new stakeholders and partners participating
Year 2			
	Travis County, COA, TCEQ	• Inspect up to 15% of the OSSF systems	• # systems inspected • # malfunctioning systems repaired • load reduction based on # of failing systems corrected
	LCRA (in conjunction with Travis County and COA)	• Conduct one workshop for OSSF owners	• # of participants • # requesting assistance
	Travis County, COA, TCEQ	• Map created that identifies septic systems in the watershed and identifies OSSFs that could be connected to a centralized wastewater treatment facility	• # of OSSFs identified in the watershed • # of OSSFs identified that could be connected to centralized system • updated map of inspected areas
	Travis County, COA, TCEQ, LCRA	• Provide educational materials to OSSF owners. Three existing LCRA educational booklets are available for distribution by Travis County and COA. Travis County and COA will mail the booklet to OSSF owners with their permits or as a separate, direct mail out or as needed	• # of materials distributed
	Travis County, COA, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ. Status report to include number of OSSFs inspected, and the number of malfunctioning OSSFs repaired or replaced	• # of sustained partners and stakeholders participating • # new stakeholders and partners participating • # partners presenting information

Table A-1, continued

Plan Year	Responsible Parties	Implementation Measure	Implementation Milestones
Year 3			
	Travis County, COA, TCEQ	• Inspect up to 25% of the OSSF systems	• # systems inspected; • # malfunctioning systems repaired • load reduction based on # of failing systems corrected systems
	Travis County, COA, TCEQ, LCRA	• Provide educational materials to OSSF owners. Three existing LCRA educational booklets are available for distribution by Travis County and COA. Travis County and COA will mail the booklet to OSSF owners with their permits or as a separate, direct mail out or as needed	• # of materials distributed
	Travis County, COA, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ. Status report to include number of OSSFs inspected, and the number of malfunctioning OSSFs repaired or replaced	• # of sustained partners and stakeholders participating • # new stakeholders and partners participating • # partners presenting information
Year 4			
	Travis County, COA, TCEQ	• Inspect up to 25% of the OSSF systems	• # systems inspected • # malfunctioning systems repaired • load reduction based on # of failing systems corrected systems
	Travis County, COA, TCEQ, LCRA	• Provide educational materials to OSSF owners. Three existing LCRA educational booklets are available for distribution by Travis County and COA. Travis County and COA will mail the booklet to OSSF owners with their permits or as a separate, direct mail out or as needed.	• # of materials distributed
	Travis County, COA, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ. Status report to include number of OSSFs inspected, and the number of malfunctioning OSSFs repaired or replaced	• # of sustained partners and stakeholders participating; • # new stakeholders and partners participating; • # partners presenting information
Year 5			
	Travis County, COA, TCEQ	• Partners evaluate the effectiveness of implementing this management measure. If this program is found to be successful, the remaining priority OSSF systems will be inspected	• # systems inspected; • # malfunctioning systems repaired; • load reduction based on # of failing systems corrected systems
	Travis County, COA, TCEQ, LCRA	• Provide educational materials to OSSF owners. Three existing LCRA educational booklets are available for distribution by Travis County and COA. Travis County and COA will mail the booklet to OSSF owners with their permits or as a separate, direct mail out or as needed	• # of materials distributed
	Travis County, COA, TCEQ	• Update stakeholder entity at a yearly meeting hosted by TCEQ. Status report to include number of OSSFs inspected, and the number of malfunctioning OSSFs repaired/replaced	• # of sustained partners and stakeholders participating • # new stakeholders and partners participating • # partners presenting information

Table A-2. Natural Resource Management Measures — Implementation Schedules and Tasks

Plan Year	Responsible Parties *Dependent on landowners' participation	Implementation Schedule	Implementation Milestones
Year 1			
	LCRA Creekside Conservation Program, landowners	• Interested landowner contacts local NRCS office • Conservation plan is developed and implemented on participating landowners' property • LCRA, NRCS, and SWCD evaluate the project potential and selects projects for matching funds • Conduct Landowner Field Day if needed	• # of landowners contacting LCRA/NRCS • # of landowner conservation plans developed • # of acres covered by conservation plans • amount of cost-share spent to implement specific BMPs • # of people participating in Field Day • # of landowners interested in participating in technical and financial assistance programs based on field day
	USFWS-Partners for Fish and Wildlife	• Interested landowner contacts local USFWS office • USFWS evaluates the project potential and selects projects for matching funds and develops conservation plan	• # of landowners contacting USFWS • # of conservation plans developed
	TSSWCB, SWCD, NRCS, landowners	• Interested landowner contacts local SWCD office • WQMP is developed and implemented on participating landowners' property • SWCD, TSSWCB, and NRCS evaluate the specific BMPs to be implemented and recommends to landowners appropriate state or federal cost-share assistance programs • Status reviews conducted to ensure landowners implement BMPs as specified and agreed to in the WQMP implementation schedule	• # of landowners contacting SWCD • # of WQMPs developed and certified • amount of cost-share spent to implement specific BMPs • Status reviews conducted and follow-up assistance needs documented
	TPWD	• Interested landowner contacts local TPWD district biologist office • Biologist schedules a site visit to assess habitat potential and offer guidance to improve habitat for the species of interest	• # of landowners contacting TPWD • # of site visits conducted
	TWS Feral Hog Abatement Program; landowners	• Landowner contacts TWS • TWS develops plan with landowner • TWS conducts direct feral hog control	• # of landowners contacting TWS • # of plans developed with landowners • # of feral hogs removed from the watershed
	City of Pflugerville	• Increase street sweeping as funding becomes available • Land acquired in riparian zone as funding allows	• additional street sweeping near creeks and riparian zones within the City of Pflugerville • acres acquired and funding available for land acquisition
	Texas AgriLife Extension Service	• Distribute feral hog management publications • Promote availability and utility of online reporting tool	• # of publications distributed or # of landowners receiving publications • # of unique website hits and # of feral hog reports from Gilleland Creek
	TSSWCB, SWCD, NRCS, LCRA Creekside Conservation Program; USFWS-Partners for Fish and Wildlife; TPWD; TWS; TPL, City of Pflugerville, AgriLife; TCEQ	• Provide status reports to stakeholders at a yearly meeting hosted by TCEQ	• # of sustained partners and stakeholders participating • # new stakeholders and partners participating • # partners presenting information

Table A-2, continued

Plan Year	Responsible Parties *Dependent on landowners' participation	Implementation Schedule	Implementation Milestones
Year 2			
	LCRA Creekside Conservation Program; landowners	• Interested landowner contacts local NRCS office • Conservation plan is developed and implemented on participating landowners' property • LCRA, NRCS, and SWCD evaluate the project potential and selects projects for matching funds • Conduct Landowner Field Day if needed	• # of landowners contacting LCRA/NRCS • # of landowner conservation plans developed • amount of cost-share spent to implement specific BMPs • # acres covered by conservation plans • bacteria loading reduction based on completion of BMP implementation planned in Year 1 • # of people participating in Field Day • # of landowners interested in participating in technical and financial assistance programs based on field day
	USFWS-Partners for Fish and Wildlife	• USFWS works with landowners to implement projects	• Progress toward completing projects demonstrated
	TSSWCB, SWCD, NRCS, landowners	• Interested landowner contacts local SWCD office • WQMP is developed and implemented on participating landowners' property • SWCD, TSSWCB, and NRCS evaluate the specific BMPs to be implemented and recommends to landowner appropriate state or federal cost-share assistance programs • Status reviews are conducted to ensure that the landowners implement BMPs as specified and agreed to in the WQMP implementation schedule	• # of landowners contacting SWCD • # of WQMPs developed and certified • amount of cost-share spent to implement specific BMPs • # acres covered by WQMPs • bacteria loading reduction based on completion of BMP implementation planned in Year 1 • Status reviews conducted and follow-up assistance needs documented
	TPWD	• A wildlife management plan (WMP) is written by the landowner or with the assistance of biologist	• # of landowner WMP completed
	TWS Feral Hog Abatement Program	• Landowner contacts TWS • TWS develops plan with landowner • TWS conducts direct feral hog control	• # of landowners contacting TWS • # of plans developed with landowners • # of feral hogs removed from the watershed • bacteria loading reduction based on feral hogs removed in Year 1
	City of Pflugerville	• Increase street sweeping as funding becomes available • Land acquired in riparian zone if funding allows	• additional street sweeping near creeks and riparian zones within the City of Pflugerville • Acres of land acquired
	Texas AgriLife Extension Service	• Delivery of LSHS-Grazing Cattle curriculum • Delivery of LSHS-Horses curriculum • Delivery of LSHS-Feral Hog curriculum	• # of landowners participating in LSHS workshops • documented change in BMP adoption rates based on pre- and post-surveys conducted at LSHS workshops
	TSSWCB, SWCD, NRCS, LCRA Creekside Conservation Program; USFWS-Partners for Fish and Wildlife; TPWD; TWS; TPL, City of Pflugerville, AgriLife; TCEQ	• Provide status reports to stakeholders at a yearly meeting hosted by TCEQ	• # of sustained partners and stakeholders participating • # new stakeholders and partners participating • # partners presenting information

Table A-2, continued

Plan Year	Responsible Parties *Dependent on landowners' participation	Implementation Schedule	Implementation Milestones
Year 3			
	LCRA Creekside Conservation Program; landowners	• Interested landowner contacts local NRCS office • Conservation plan is developed and implemented on participating landowners' property • LCRA, NRCS, and SWCD evaluate the project potential and selects projects for matching funds • Conduct Landowner Field Day if needed	• # of landowners contacting LCRA/NRCS • # of landowner conservation plans developed • Amount of cost-share spent to implement specific BMPs • # acres covered by conservation plans • bacteria loading reduction based on completion of BMP implementation planned in Year 2 • # of people participating in Field Day • # of landowners interested in participating in technical and financial assistance programs based on field day
	USFWS-Partners for Fish and Wildlife	• Landowners complete projects.	• # of acres with completed projects • bacteria loading reduction based on project • amount of landowner funds for projects • amount of matching funds provided
	TSSWCB, SWCD, NRCS, landowners	• Interested landowner contacts local SWCD office • WQMPs developed and implemented on landowners' properties • SWCD, TSSWCB, and NRCS evaluate the specific BMPs to be implemented and recommends to landowner appropriate state or federal cost-share assistance programs • Status reviews conducted to ensure that landowners implement BMPs as specified and agreed to in the WQMP implementation schedule	• # of landowners contacting SWCD • # of WQMPs developed and certified • Amount of cost-share spent to implement specific BMPs • # acres covered by WQMPs • bacteria loading reduction based on completion of BMP implementation planned in Year 2 • Status reviews conducted and follow-up assistance needs documented
	TPWD	• WMP is approved by TPWD biologist, landowner conducts surveys	• # of landowner WMPs approved by TPWD • # of surveys completed
	TWS Feral Hog Abatement Program	• Landowner contacts TWS • TWS develops plan with landowner • TWS conducts direct feral hog control	• # of landowners contacting TWS • # of plans developed with landowners • # of feral hogs removed from the watershed • bacteria loading reduction based on feral hogs removed in Year 2
	City of Pflugerville	• Increase street sweeping as funding becomes available. • Land acquisition in riparian zone as funding allows	• additional street sweeping near creeks and riparian zones within the City of Pflugerville • Acres acquired
	Texas AgriLife Extension Service	• Delivery of LSHS-Grazing Cattle curriculum • Delivery of LSHS-Horses curriculum • Delivery of LSHS-Feral Hog curriculum	• # of landowners participating in LSHS workshops • documented change in BMP adoption rates based on pre- and post-surveys conducted at LSHS workshops

Table A-2, continued

Plan Year	Responsible Parties *Dependent on landowners' participation	Implementation Schedule	Implementation Milestones
	TSSWCB, SWCD, NRCS, LCRA Creekside Conservation Program; USFWS-Partners for Fish and Wildlife; TPWD; TWS; TPL, City of Pflugerville, AgriLife; TCEQ	• Provide status reports to stakeholders at a yearly meeting	• # of sustained partners and stakeholders participating • # new stakeholders and partners participating • # partners presenting information
Year 4			
	LCRA Creekside Conservation Program; landowners	• Interested landowner contacts local NRCS office • Conservation plan is developed and implemented on participating landowners' property • LCRA, NRCS, and SWCD evaluate the project potential and selects projects for matching funds • Conduct Landowner Field Day if needed	• # of landowners contacting LCRA/NRCS • # of landowner conservation plans developed • amount of cost-share spent to implement specific BMPs • # acres covered by conservation plans • bacteria loading reduction based on completion of BMP implementation planned in Year 3 • # of people participating in Field Day • # of landowners interested in participating in technical and financial assistance programs based on field day
	USFWS-Partners for Fish and Wildlife	• USFWS reviews project	• # of acres with completed projects • bacteria loading reduction based on project • amount of landowner funds for projects • amount of matching funds provided
	TSSWCB, SWCD, NRCS, landowners	• Interested landowner contacts local SWCD office • WQMPs developed and implemented on landowners' properties • SWCD, TSSWCB, and NRCS evaluate the specific BMPs to be implemented and recommends to landowner appropriate state or federal cost-share assistance programs • Status reviews conducted to ensure landowners implement BMPs as specified and agreed to in the WQMP implementation schedule	• # of landowners contacting SWCD • # of WQMPs developed and certified • amount of cost-share spent to implement specific BMPs • # acres covered by WQMPs • bacteria loading reduction based on completion of BMP implementation planned in Year 3 • status reviews conducted and follow-up assistance needs documented
	TPWD	• Landowner conducts surveys of species of interest	• # of surveys completed
	TWS Feral Hog Abatement Program	• Landowner contacts TWS • TWS develops plan with landowner • TWS conducts direct feral hog control	• # of landowners contacting TWS • # of plans developed with landowners • # of feral hogs removed from the watershed • bacteria loading reduction based on feral hogs removed in Year 3
	City of Pflugerville	• Increase street sweeping as funding becomes available • Land in the riparian zone acquired if funding allows.	• additional street sweeping near creeks and riparian zones within the City of Pflugerville • acres of land acquired
	Texas AgriLife Extension Service	• Delivery of LSHS-Grazing Cattle curriculum • Delivery of LSHS-Horses curriculum • Delivery of LSHS-Feral Hog curriculum	• # of landowners participating in LSHS workshops • documented change in BMP adoption rates based on pre- and post-surveys conducted at LSHS workshops

Table A-2, continued

Plan Year	Responsible Parties *Dependent on landowners' participation	Implementation Schedule	Implementation Milestones
	TSSWCB, SWCD, NRCS, LCRA Creekside Conservation Program; USFWS-Partners for Fish and Wildlife; TPWD; TWS; TPL, City of Pflugerville, AgriLife; TCEQ	• Provide status reports to stakeholders at yearly meeting	• # of sustained partners and stakeholders participating • # new stakeholders and partners participating • # partners presenting information
Year 5			
	LCRA Creekside Conservation Program; landowners	• Interested landowner contacts local NRCS office • Conservation plan is developed and implemented on participating landowners' property • LCRA, NRCS, and SWCD evaluate the project potential and selects projects for matching funds • Conduct Landowner Field Day if needed • LCRA evaluates effectives of Program in achieving goals of I-Plan and makes recommendations to modify the management measure (adaptive management)	• # of landowners contacting LCRA/NRCS • # of landowner conservation plans developed • amount of cost-share spent to implement specific BMPs • # acres covered by conservation plans • bacteria loading reduction based on completion of BMP implementation planned in Year 4 • # of people participating in Field Day • # of landowners interested in participating in technical and financial assistance programs based on field day • adaptive management recommendations made
	USFWS-Partners for Fish and Wildlife	• Evaluates and adapts projects as needed.	• revisions made and corresponding improvements
	TSSWCB, SWCD, NRCS, landowners	• Interested landowner contacts local SWCD office • WQMPs developed and implemented on landowners' properties • SWCD, TSSWCB, and NRCS evaluate the specific BMPs to be implemented and recommend to landowner appropriate state or federal cost-share assistance programs • Status reviews conducted to ensure landowners implement BMPs as specified and agreed to in the WQMP implementation schedule • TSSWCB and NRCS evaluate effectiveness of WQMPs and make recommendations to modify the management measure as needed	• # of landowners contacting SWCD • # of WQMPs developed and certified • amount of cost-share spent to implement specific BMPs • # acres covered by WQMPs • bacteria loading reduction based on completion of BMP implementation planned in Year 4 • status reviews conducted and follow-up assistance needs documented • adaptive management recommendations made
	TPWD	• Landowner conducts surveys of species of interest	• # of surveys completed
	TWS Feral Hog Abatement Program	• Landowner contacts TWS • TWS develops plan with landowner • TWS conducts direct feral hog control • TWS evaluates effectiveness of feral hog control and makes recommendations to modify the management measure as needed	• # of landowners contacting TWS • # of plans developed with landowners • # of feral hogs removed from the watershed • bacteria loading reduction based on feral hogs removed in Year 4 • adaptive management recommendations made
	City of Pflugerville	• Increase street sweeping as funding allows	• additional street sweeping near creeks and riparian zones within the City of Pflugerville

Table A-2, continued

Plan Year	Responsible Parties *Dependent on landowners' participation	Implementation Schedule	Implementation Milestones
	Texas AgriLife Extension Service	• Delivery of LSHS-Grazing Cattle curriculum • Delivery of LSHS-Horses curriculum • Delivery of LSHS-Feral Hog curriculum • AgriLife evaluates the overall effectiveness of educational programs and makes recommendations to modify as needed	• # of landowners participating in LSHS workshops • documented change in BMP adoption rates based on pre- and post-surveys conducted at LSHS workshops • adaptive management recommendations made
	TSSWCB, SWCD, NRCS, LCRA Creekside Conservation Program; USFWS-Partners for Fish and Wildlife; TPWD; TWS; TPL, City of Pflugerville, AgriLife; TCEQ	• Provide status reports to stakeholders at yearly meeting • Entities evaluate effectiveness of management measure and make recommendations to stakeholders to modify the management measure as needed	• # of sustained partners and stakeholders participating • # new stakeholders and partners participating • # partners presenting information • adaptive management recommendations made

Table A-3. Storm Water Management Measures — Implementation Schedules and Tasks

Plan Year	Responsible Parties	Implementation Schedule	Implementation Milestones
Year 1			
	CRWR	• Apply for funding	• successful funding of the grant project
	CRWR	• Secure two detention facilities and appropriate permits	• permits received
	City of Pflugerville	• Detention ponds cleaned and prepared for project.	• matching funds value of pond clean-out
	CRWR	• Design, retrofit and converts structures from detention facilities to water quality facilities	• two flood control basins are successfully retrofitted with automated controls
	CRWR, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new partners and stakeholders participating • # partners presenting information
Year 2			
	CRWR	• CRWR monitors ponds during storm events	• # of storm events monitored at each pond
	COA, City of Pflugerville, City of Round Rock, Travis County	• Educational workshop/field tour (detention pond retrofit) and materials for developers	• # of attendees at workshop, number of materials developed and distributed
	CRWR, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting	• # of sustained partners and new and stakeholders participating • # partners presenting information
Year 3			
	CRWR	• Analyzes data and prepares report	• final report and observations reported
	CRWR, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new partners and stakeholders participating • # partners presenting information
Year 4			
	All stakeholders	• Review final report to assess if this management measure should be implementation throughout the Gilleland Creek Watershed.	• decisions reached about possibly retrofitting existing detention facilities in the watershed
Year 5			
	All stakeholders	• Follow-up on decisions reached about possibly retrofitting existing detention facilities in the watershed	• # of partners continuing to participate • # of adaptive management recommendations

Table A-4. Education and Outreach (Pet Waste) Management Measures — Implementation Schedules and Tasks

Plan Year	Responsible Parties	Implementation Schedule	Implementation Milestones
Year 1			
	LCRA CRWN	• Volunteer monitoring	• # of bacteria results collected • value of volunteer time
	LCRA, COA, City of Pflugerville, City of Round Rock and Travis County	• Seek additional funding • Survey park users pet waste habits • Review survey results and construct strategy	• proposals for funding drafted • results of park user survey • pet waste campaign strategy drafted
	City of Pflugerville and Travis County	• Install additional mutt mitt and waste containers • Waste receptacles and signage at pilot parks	• # of mutt mitt, waste receptacles and signs installed • matching funds provided by partners
	LCRA, CRWN, COA, City of Pflugerville, City of Round Rock, Travis County , TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information
Year 2			
	City of Pflugerville and Travis County	• Install additional mutt mitt and waste containers as needed • Waste receptacles and signage at pilot parks	• # of mutt mitt, waste receptacles and signs installed • matching funds provided by partners
	LCRA CRWN	• Volunteer monitoring	• # of bacteria results collected • value of volunteer time
	LCRA, COA, City of Pflugerville, City of Round Rock and Travis County	• Educational campaign utilizing partner resources	• # signs, brochures, and educational events
	LCRA, CRWN, COA, City of Pflugerville, City of Round Rock, Travis County , TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information
Year 3			
	LCRA CRWN	• Volunteer monitoring	• # of bacteria results collected • value of volunteer time
	LCRA, COA, City of Pflugerville, City of Round Rock and Travis County	• Evaluation of park users to determine if behaviors changed	• load reductions values based on percentage of people collecting pet waste compared to pre-education campaign • completion of post-park user survey
	LCRA, CRWN, COA, City of Pflugerville, City of Round Rock, Travis County , TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information
Years 4&5			
	LCRA CRWN	• Volunteer monitoring	• # of bacteria results collected • value of volunteer time
	LCRA, CRWN, COA City of Pflugerville, City of Round Rock, Travis County, TCEQ	• Evaluate effectiveness of implementation and make appropriate adjustments	• # of partners continuing to participate • # of adaptive management recommendations

Table A-5. Ordinance and Planning Management Measures — Implementation Schedules and Tasks

Plan Year	Responsible Parties	Implementation Schedule	Implementation Milestones
Year 1			
	COA, City of Round Rock, City of Pflugerville, Travis County	• Explore feasibility of a water quality ordinance • Begin process to develop and adopt ordinance	• establishment of stakeholder workgroup through each jurisdiction to obtain input from affected individuals
	COA, City of Round Rock, City of Pflugerville, Travis County, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information
Year 2			
	COA, City of Round Rock and City of Pflugerville, Travis County	• Present ordinance and to inform and seek approval from appointed officials • Conduct workshops for development community and appointed officials	• # of jurisdictions presenting ordinances to appointed officials • # of attendees at workshop
	COA, City of Round Rock, City of Pflugerville, Travis County, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information
Year 3			
	COA, City of Round Rock City of Pflugerville, Travis County	• Present ordinance and seek approval from elected officials	• # of ordinances approved by local governments
	COA, City of Round Rock, City of Pflugerville, Travis County, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information
Years 4&5			
	COA, Cities of Round Rock and Pflugerville, Travis County	• Ordinances implemented • Review and make adjustments	• load reduction calculations based on adopted ordinances • adjustments made based on adaptive management
	COA, City of Round Rock, City of Pflugerville, Travis County, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information
	COA, Cities of Round Rock and Pflugerville, Travis County	• Recognition program	• # of developments highlighted as part of the recognition program

Table A-6. Wastewater Treatment Facility Management Measures — Implementation Schedules and Tasks

Plan Year	Responsible Parties	Implementation Schedule	Implementation Milestones
Year 1			
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• Identify wastewater collection systems components within 100 ft of Gilleland Creek and tributaries	• # of GPS coordinates collected on collection systems within 100 ft of Gilleland Creek and tributaries
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• WWTFs will inspect the collection systems within 100 ft of the creek and tributaries, complete inspection report form and repair systems where failures identified	• # collection systems miles inspected • # of failures identified and repaired • loading reductions based on repairs • reports submitted to TCEQ TMDL staff
	Interested WWTF- possibly to include COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• Collection systems join TCEQ's SSO Initiative	• # of WWTF entering into agreements with TCEQ through the SSO Initiative • decrease in the number of SSOs
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information
Year 2			
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• WWTFs will inspect the collection systems within 100 ft of the creek and tributaries, complete inspection report form and repair systems where failures identified.	• # collection systems miles inspected • # of failures identified and repaired • loading reductions based on repairs • reports submitted to TCEQ TMDL staff
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• GPS coordinates of collection system components are added to available GIS layers.	• # components with GPS coordinates
	Interested WWTF- possibly to include COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• Collection systems join TCEQ's SSO Initiative	• # of WWTF entering into agreements with TCEQ through the SSO Initiative • decrease in the number of SSOs
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ • Inserts or flyers distributed to utility customers	• # of sustained and new stakeholders participating • # partners presenting information • # of educational materials distributed
Year 3			
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• WWTFs will inspect the collection systems within 100 ft of the creek and tributaries, complete inspection report form and repair systems where failures identified	• # collection systems miles inspected • # of failures identified and repaired • loading reductions based on repairs • reports submitted to TCEQ TMDL staff
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• GPS coordinates of collection system components are added to available GIS layers	• # components with GPS coordinates

Table A-6, continued

Plan Year	Responsible Parties	Implementation Schedule	Implementation Milestones
	Interested WWTF- possibly to include COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• Collection systems join TCEQ's SSO Initiative	• # of WWTF entering into agreements with TCEQ through the SSO Initiative • decrease in the number of SSOs
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ • Inserts or flyers distributed to utility customers	• # of sustained and new stakeholders participating • # partners presenting information • # of educational materials distributed
Years	**4&5**		
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• WWTFs will inspect the collection systems within 100 ft of the creek and tributaries, complete inspection report form and repair systems where failures identified	• # collection systems miles inspected • # of failures identified and repaired • loading reductions based on repairs • reports submitted to TCEQ TMDL staff
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• GPS coordinates of collection system components are added to available GIS layers	• # components with GPS coordinates
	Interested WWTF- possibly to include COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities	• Collection systems join TCEQ's SSO Initiative	• # of WWTF entering into agreements with TCEQ through the SSO Initiative • decrease in the number of SSOs
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ • Inserts or flyers distributed to utility customers	• # of sustained and new stakeholders participating • # partners presenting information • # of educational materials distributed
	COA, City of Pflugerville, Dessau Fountain Estates, Windermere Utilities, TCEQ	• Review and evaluate the effectiveness of program in Year 5	• adaptive management strategies implemented

Table A-7. Wastewater Treatment Facilities Control Actions — Implementation Schedules and Tasks

Plan Year	Responsible Parties	Implementation Schedule	Implementation Milestones
Year 1			
	COA, City of Pflugerville, Windermere Utilities, TCEQ	• WWTFs to monitor effluent *E.coli* concentrations as required by their discharge permits and report monitoring results in DMRs to TCEQ	• # of WWTF *E.coli* monitoring within permit limits • # of monthly DMRs submitted to TCEQ • # operational changes made based on values that exceed monitoring limit • load values reduced based on operational changes
	COA, City of Pflugerville, Windermere Utilities, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information
Year 2			
	COA, City of Pflugerville, Windermere Utilities, TCEQ	• WWTFs to monitor effluent *E.coli* concentrations as required by their discharge permits and report monitoring results in DMRs to TCEQ	• # of WWTF *E.coli* monitoring within permit limits • # of monthly DMRs submitted to TCEQ • # operational changes made based on values that exceed monitoring limit • load values reduced based on operational changes
	COA, City of Pflugerville, Windermere Utilities, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information
Year 3			
	COA, City of Pflugerville, Windermere Utilities, TCEQ	• WWTFs to monitor effluent *E.coli* concentrations as required by their discharge permits and report monitoring results in DMRs to TCEQ	• # of WWTF *E.coli* monitoring within permit limits • # of monthly DMRs submitted to TCEQ • # operational changes made based on values that exceed monitoring limit • load values reduced based on operational changes
	COA, City of Pflugerville, Windermere Utilities, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information
Years 4&5			
	COA, City of Pflugerville, Windermere Utilities, TCEQ	• WWTFs to monitor effluent *E.coli* concentrations as required by their discharge permits and report monitoring results in DMRs to TCEQ	• # of WWTF *E.coli* monitoring within permit limits • # of monthly DMRs submitted to TCEQ • # operational changes made based on values that exceed monitoring limit • load values reduced based on operational changes
	COA, City of Pflugerville, Windermere Utilities, TCEQ	• Provide status reports to stakeholder entity at a yearly meeting hosted by TCEQ	• # of sustained and new stakeholders participating • # partners presenting information

Appendix B.
Implementation Forms

On-site Sewage Facility Prioritization Process

Date of evaluation:

Address:

Jurisdiction:

Age of system (in years) if unknown, enter 50

Maintenance contract in effect? (if yes enter 0, if no enter 50)

Property proximity to Gilleland Creek or tributary (in feet from centerline)_____ (within 200 feet enter 100, 200feet to 300feet enter 50, more than 300 feet enter 0)

Flood Zone_____ (if A, AE, or AO enter 50, if X enter 0)

Tract size ____ acres (if less than 1/2 acre enter 50, between 1/2 and 1 acre enter 25, between 1 and 2 acres enter 10, greater than 2 acres enter 0)

Commercial system? If Yes enter 30, if No enter 0

Soils in which the system is located (for Type Ib or IV enter 10, for types II or III enter 0, if unknown enter 10)

Public water supply? If Yes enter 10, If No enter 0

Gilleland OSSF Inspection Form

Date of inspection: _____Inspector/Agency: _____

Address of property: _____

File/Unique Number: _____System Rank: _____

Longitude: _____ Latitude: _____

Center of drainfield

Circle One

Property in use?	Yes	No
Type of use: Residential Commercial: _____		
Circle One If commercial indicate type of use		

Circle One

Is surface water effectively diverted away from system and components?	Yes	No
Are system components free from settling or erosion?	Yes	No
Are system components properly covered/capped?	Yes	No
Comments: _____		

Circle One

Is system free from encroachments?	Yes	No
If No, Type of encroachment? Paving Decks Easements Sprinkler Systems		
Livestock Pets Vehicular Traffic Other: _____		
Type of vegetation over drainfield? _____		
Condition of vegetation over drainfield? Poor Uneven Excessive		
Circle One		

Circle One

Odor within 10-feet of perimeter of the system?	Yes	No
Source and description of odor: _____		
Mosquitoes or flies present?	Yes	No
Surfacing effluent?	Yes	No
Soil over drainfield saturated (no effluent surfacing)?	Yes	No

Comments:

_____

_____

Appendix C.
Load Reduction

Management Measure 1.0 Load Reductions

This section estimates the potential bacteria load reductions that can be achieved by identifying, prioritizing, inspecting, and bringing into compliance OSSFs in the Gilleland Creek Watershed. The *E. coli* loading from malfunctioning OSSFs is estimated by using the following equation from the document EPA 2001 *Protocol for Developing Pathogen TMDLs*.

$$\frac{\#\text{ counts}}{\text{day}} = (\#\text{fail systems}) * \frac{10^6 \text{ counts} * 0.8\text{x } 0.125\%}{100 \text{ ml}} * \frac{70 \text{ gallons}}{\text{person day}} * \frac{\#\text{ persons}}{\text{household}} * \frac{3785.2 \text{ ml}}{\text{gallon}}$$

Inputs and assumptions associated with this equation include:

1) Total number of on-site sewage facility systems is 2045.
2) An 8 percent failure rate for OSSFs based on an EPA 2001 *Protocol for Developing Pathogen TMDLs* document. It is assumed that 164 failing OSSFs will be found in the watershed.
3) Fecal coliform concentration in OSSF effluent was estimated to be 10^6/100 milliliters of effluent. In general, *E. coli* concentrations are approximately 80 percent of fecal coliform concentrations. An *E .coli* concentration of 1000 cfu/100 mL is assumed because some treatment level is expected from even malfunctioning OSSFs.
4) 2.42 persons/household determined from 2000 U.S. census.
5) That all OSSF malfunctions impact Gilleland Creek though there is some treatment from even malfunctioning systems.

Given the assumptions and considerations shown above, the *E. coli* loading to Gilleland Creek from malfunctioning OSSFs would be 1.05×10^{11} cfu/day.

If 25 percent of known OSSFs are inspected each year and malfunctioning systems are repaired or replaced, the expected load reduction of 2.62×10^{10} cfu/day is possible each year. The location of the system and its proximity to the creek, as well as, the severity of the malfunction could result in a greater or lesser bacteria load to the water body than what is assumed in the above calculation.

Management Measure 2.0 Load Reductions

The following sections describe the calculations made using the best available resources to estimate potential bacteria loading reductions resulting from the implementation of preservation and restoration projects as well as feral hog removal efforts in the Gilleland Creek watershed. The following assumptions were used in calculating the bacteria load reductions:

- Four individual projects protecting approximately 472 acres of riparian areas. Acreage is based on the "average" size of projects with Creekside Conservation Program, NRCS, USFWS, and TPWD.
- Removal of 20 percent of the estimated 383 feral hogs.
- Sediment reduction of 2 tons/acre/year is estimated.[11]
- 1,000 cfu fecal coliform/gram of sediment.[12]
- A ratio of 0.7 *E. coli*/fecal coliform.[13]
- The correlation coefficient between total suspended solids (TSS) and *E. coli* (after evaluating 74 data pairs from LCRA ambient water quality monitoring at site 17257) is 0.963.

LCRA Creekside Conservation Program

The loading reduction calculation is based on one project of 216 acres being completed. A completed project is one in which the work has been performed according to the plan developed by the landowner and NRCS. The estimated load reduction from the Creekside Conservation Program is 2.74×10^{11} cfu/day. Experience with the Creekside Conservation Program has shown that once landowners make improvements to their property they see tangible benefits to continuing the conservation practices.

Load Calculation:

216 acres "average" size x 2 tons/acre soil savings x 2,000 lbs./ton x 0.4536 kg/lb. x 1,000 g/kg x 1000 cfu fecal coliform/gram x 0.7 E. coli/fecal coliform = 2.74×10^{11} cfu/day

The Rangeland Hydrology and Erosion Model (RHEM) model will be used to demonstrate expected soil savings. The RHEM is a coordinated project between three U.S. Department of Agriculture agencies: Agricultural Research Service, NRCS, and the U.S. Forest Service. The model components include fundamentals of infiltration, hydrology, plant science, hydraulics, and erosion mechanics. The most notable advantage of RHEM over

[11] Sediment reduction estimate is based on best professional judgment by LCRA staff and experts in the industry.

[12] HDR Report, 2003. Water Quality Study of the Arkansas River, Phase 2 Report. Fecal coliform values in sediment ranged from 13 cfu/gram of sediment to 2,000 cfu/gram of sediment. Based on best professional judgment and this range of bacteria concentrations, a value of 1,000 cfu/gram of sediment was selected.

[13] Test results show that E. coli bacteria constitute about 70 percent of fecal coliform concentrations.

previous models is that it links hydrologic and erosion dynamics with rangeland plant communities and vegetation states.

NRCS Farm Bill Programs

The loading reduction calculation is based on one project of 216 acres being completed. The estimated load reduction from one of the NRCS projects is 2.74×10^{11} cfu/day.

Load Calculation:

216 acres "average" size x 2 tons/acre soil savings x 2,000 lbs./ton x 0.4536 kg/lb. x 1,000 g/kg x 1000 cfu fecal coliform/gram x 0.7 E. coli/fecal coliform. $= 2.74 \times 10^{11}$ cfu/day

USFWS Partners for Fish and Wildlife

The loading reduction calculation is based on one project of 20 acres being completed. The estimated load reduction from one of the USFWS projects is 2.54×10^{10} cfu/day. Assuming the completion of one Partners for Fish and Wildlife Program project, an *E. coli* load reduction is expected. It is likely that the constructed BMP will need to go dry between rainfall events to lead to a reduction in bacteria values. The desiccation will help reduce viable, possibly encysted *E. coli* living in the sediment.

Load Calculation:

20 acres "average" size x 2 tons/acre soil savings x 2,000 lbs./ton x 0.4536 kg/lb. x 1,000 g/kg x 1000 cfu fecal coliform/gram x 0.7 E. coli/fecal coliform. = 2.54×10^{10} cfu/day

TPWD Landowner Services

The estimated *E. coli* load reduction from the completion of one, 20-acre TPWD Landowner Services project is 2.54×10^{10} cfu/day.

Load Calculation:

20 acres "average" size x 2 tons/acre soil savings x 2,000 lbs./ton x 0.4536 kg/lb. x 1,000 g/kg x 1000 cfu fecal coliform/gram x 0.7 E. coli/fecal coliform. = 2.54×10^{10} cfu/day

Texas Wildlife Services

Loading reductions resulting from feral hog removal were based on the Metcalf and Eddy 1991 estimate of fecal coliform per hog and the Texas Water Resources Institute Technical Report No. 347 estimates of feral hog loading rate. Fecal coliform loading from feral hogs $= 1.21 \times 10^{9}$ organisms/day. Based on best professional judgment and reproductive rate of remaining feral hogs, it is assumed that 20 percent of the 383[14] estimated feral hogs are removed from the watershed. This reduction in feral hog numbers equates to a loading reduction of 4.77×10^{11} cfu *E. coli*/day.

[14] This estimate is based on Texas Wildlife Services experience of ten hogs/ square mile within the buffers that are 1/2 mile from creeks. And with using an area of 38.3 square miles, which is 1/2-mile swath around Gilleland and major tributaries, there will be an estimated 383 hogs.

Load Calculation:

383 hogs x 0.2 (20 percent removal) x 1.21 x 109 fecal coliform cfu/hog/day x 0.7 E. coli/fecal coliform. = 6.49×10^{10} cfu/day

Table C-1. Summary of Five-Year Load Reductions with Moderate Flow

Project	Load Reduction (cfu/day)
LCRA, Creekside Conservation	2.74×10^{11}
NRCS, EQIP, WHIP, CCRP	2.74×10^{11}
USFWS Partner for Fish and Wildlife	2.54×10^{10}
TPWD, Landowner Services	2.54×10^{10}
Texas WDMS, feral hog removal	6.49×10^{10}

Management Measure 3.0 Load Reductions

The following sections describe the calculations made using the best available resources to estimate potential bacteria loading reductions resulting from the implementation of retrofitting existing storm-water detention basins to perform as water quality facilities to reduce bacteria concentrations. The ability of extended detention facilities to remove total suspended solids (TSS) and other contaminants from storm water has been demonstrated, with probable TSS removal ranging from 50 to 95 percent (Middleton et. al., 2008). However, the potential ability of these facilities to remove bacteria is more clearly defined in another recent study:

> Swale and detention pond BMPs appear to have low effectiveness in reducing bacteria and in some cases have the potential for exporting bacteria…Due to the wide variability of bacterial data, it is difficult to make accurate estimates of expected pollutant loading and pollutant removal that are transferable from site-to-site with any degree of confidence." In the fecal coliform data presented for detention basins, five of nine showed geometric mean concentrations to be higher in the inflow than the outflow while, conversely, four showed higher concentrations in the outflow (Clary et. al., 2008).

As this study shows, bacteria removal is more complex than TSS removal as well as more difficult to quantify. For example, the work group noted that bacteria reductions could be offset by waterfowl and wildlife that are drawn to the new habitat created by a BMP.

Evaluating BMP performance

Literature notes that it is not appropriate to quantify the benefit provided by a storm water BMP based entirely on its percent removal of a particular contaminant. Instead, the benefits should be based on the cumulative effects of reducing concentrations, volume, and total load. For example, experts in the work group noted that BMPs such as bioretention, vegetated biofilters, and in some cases, dry-extended detention basins, have the ability to reduce runoff volumes via infiltration and/or evapotranspiration losses. Therefore, in spite of the lack of literature data demonstrating high percent removal of bacteria, these BMPs may have some limited effectiveness in reducing bacteria load into Gilleland Creek by accounting for a combination of volumetric and total bacteria load reductions. For this reason, further study is warranted on the effectiveness of retrofitting detention facilities to perform as water quality facilities.

Management Measure 4.0 Load Reductions

The Gilleland Creek watershed supports a growing population of 44,139 people, with an estimated 2.4 people per household results in approximately 18,391 households (US Census 2000). Research conducted by the American Veterinary Medical Association shows that 37.2 percent of United States households own dogs, with an average of 1.7 dogs per dog-owning household (American Veterinary Medical Association U.S. Pet Ownership Calculator 2007). It is estimated that the Gilleland Creek watershed dog population is 11,630 dogs. Dog waste can increase bacteria sources within the watershed. The EPA estimates that 2 to 3 days of droppings from a population of 100 dogs in a watershed measuring up to 20-square miles that drains to a small coastal bay could contribute enough bacteria and nutrients to temporarily close the bay to swimming and shell fishing (EPA 1993).

A study in a Washington, D.C. suburb found that dogs produce approximately 0.42 pounds of fecal waste per day (Thorpe 2003). Assuming the average size dog produces 0.42 pounds of waste per day and estimating the Gilleland Creek watershed dog population to be 11,630 dogs, the dogs in the Gilleland Creek watershed could produce over 4,800 pounds of waste a day. While pet owners dispose of some of this waste properly, much of the pet waste is not disposed of properly. Using the statistic that 43 percent of dog owners never pick up pet waste means over 2000 pounds of dog waste are deposited in the Gilleland Creek watershed each day. When dog waste is left on park grass and along trails, runoff from rain and sprinklers can carry it into waterways. Pet waste is expected to be higher in urban areas of the watershed.

A single gram of dog feces can contain 23 million fecal coliform bacteria (Van der Wel 1995). The National People and Pets Survey found that around 44 percent of dog owners stated they “always” or “sometimes” picked up their dog's feces in public places (McHarg, Baldock, Headly, Robinson 1995). However, the same study found around 43 percent of dog owners stated they “never” pick up their dog’s feces. Given there are 6,841 households with dogs in the Gilleland Creek watershed, it can be estimated that 2,873 households do not pick up their pet’s waste. Using the number of households that do not pick up pet waste and then estimating there are 1.7 dogs per dog-owning household, there are approximately 4,884 dogs in the watershed whose waste potentially contribute bacteria to Gilleland Creek. Adopting simple practices such as cleaning up after pets can help reduce the impact of pet waste on waterways.

Daily Potential for E. coli loading from dog waste in the Gilleland Creek watershed =

*{{# dog *(fecal coliform bacteria per dog per day)}*(0.7601)}*

Where

$5x10^9$ colony forming units (cfu)/day is the average daily fecal coliform bacteria production per dog (EPA 2001).

Where

wet weather: *E. coli* = 0.7601 * fecal coliform (LTI 1991)

$[\{4,884*(5x10^9)\} * 0.7601] = 1.86X10^{13}$cfu/day

Daily Potential for E. coli loading from dog waste based on flow values =

*($1.86x10^{13}$ * # flow days in a year) /365 days*
Using 9 months worth of data (July 05-March 06) an estimation of high flow (>45 f^3/second) and moderate flow (16.5 ft^3/second to 45 ft^3/second) days per year were calculate (20 high flow days and 25 moderate flow days).

Daily Potential for *E. coli* loading from dog waste based on <u>high flow</u> =
*(($1.86x10^{13}$ * 20 days)/365) = $1.02x10^{12}$ cfu/day*

Daily Potential for *E. coli* loading from dog waste based on <u>moderate flow</u> =
*(($1.86x10^{13}$ * 25 days)/365) = $1.27x10^{12}$ cfu/day*

Management Measure 5.0 Load Reductions

A water-quality ordinance would only impact future development or redevelopment in the Gilleland Creek Watershed. Therefore, the impact of the ordinance will be to reduce future increases in bacterial loads to Gilleland Creek. However, through redevelopment, the impact of the ordinance could reduce existing bacterial loads; but in general, its importance is to minimize the impact of future development on the watershed.

New development that mimics a natural system can be expected to reduce the impact of that development on its watershed. However, impacts from the proposed ordinance on future development in Gilleland Creek cannot be quantified without a more rigorous modeling analysis. This is because the impact of the ordinance is highly dependent upon the source of the contamination, anticipated development, and other factors.

For example, if the source of bacteria loading is from agricultural nonpoint source runoff, then the impact of the regulation will differ depending on where new development occurs, and on whether agricultural land uses are changed, along with the nature of subsequent new development. Alternatively, if the majority of the bacteria load in the watershed result from urban nonpoint sources runoff, then the impact of the proposed ordinance would be very different. Although it cannot be quantified, it is an essential component of reducing further development impacts. However, it is expected that a load reduction will be achieved from proposed new development and redevelopment complying with the Gilleland Creek Watershed Water Quality Ordinance Framework.

Future development in the Gilleland Creek Watershed will be heavily influenced by the various local governments. Each will explore the feasibility of a water quality ordinance that is consistent with the ordinance framework.

Management Measure 6.0 Load Reductions

A load reduction is expected from wastewater collection line visual inspections and follow-up repairs. As stated, the WWTFs will inspect the collection systems within 100 feet of the creek and tributaries. There are too many unknowns at this time to calculate a reduction in loading due to collection system improvements resulting from visual inspections. Some unknown factors include exfiltration rate, proximity of leaking collection system to Gilleland Creek or tributaries, length of collection system near the creeks, pipe material, and quality of installation. These unknowns will be addressed as more is learned about the collections systems near Gilleland Creek.

If some of these factors were known then the load calculation would be determined as follows (Metcalf & Eddy 1991):

> Flow x percentage of flow expected to reach Gilleland Creek or its tributaries
> x *E. coli* concentration in untreated wastewater (between 10^4 to 10^5 cfu/1 ml) [15]
> x conversion factors.

The loading reduction calculation would show how much less bacteria would enter the creek because of correcting collection-system integrity failures.

[15]The concentration for one milliliter is shown.

Control Action 1.0

The Gilleland Creek TMDL waste load allocation (loading contribution from the WWTFs) is 6.35 x 10^{10} colony forming units (cfu)/day based on a 120 cfu/100 milliliters *E. coli* concentration and total maximum permitted flow allowed from the WWTFs.

Monitor and report effluent *E. coli* concentrations

During the TMDL data collection period, specifically March and June 2006, LCRA performed a regrowth study to determine if *E. coli* concentrations were surviving the disinfection process in all of the WWTFs in the watershed. At that time, unanticipated operational problems were encountered at the City of Pflugerville WWTF due to solids settling in a pipe downstream of the de-chlorination vessel. Both, the City of Pflugerville and LCRA measured *E. coli* concentration in the City's final effluent. The City immediately corrected the problem resulting in the *E. coli* loading reduction of 3.00 x 10^9 cfu/day. The calculations for determining the load reduction are shown below:

Before operational changes were made:

> 22 cfu/100 ml x 4.4 MGD daily average flow x (1,000,000 gal/MG) x (3.785 L/gallon) x (1000 mL/L) x (100-ml/100 ml) = 3.66 x 10^9 cfu/day.

After operational changes were made:

> 4 cfu/100 ml x 4.4 MGD daily average flow x (1,000,000 gal/MG) x (3.785 L/gallon) x (1000 mL/L) x (100-ml/100 ml) = 6.66 x 10^8 cfu/day.

Decrease in loading 3.66 x 109 cfu/day – 6.66 x 108 cfu/day = 3.00 x 109 cfu/day.

Dessau Fountain Estates / Walnut Creek WWTF Consolidation:

A bacteria load reduction is expected as a result of the Dessau Fountain Estates facility being taken off-line and connecting to City of Austin, Walnut Creek WWTF. After the connection is made, the effluent will no longer be discharged into Harris Branch and will instead be conveyed to Walnut Creek for treatment and discharge. The final effluent will not be discharged within the Gilleland Creek watershed.

The anticipated load reduction because of this wastewater regionalization effort is 7.15 x 108 cfu/day and the calculation is as follows:

> 126 cfu/100 ml x 0.15 MGD daily average flow x (1,000,000 gal/MG) x (3.7854 L/gallon) x (10 dL/L) = 7.15 x 10^8 cfu/day.

Appendix D.
Gilleland Creek Watershed
Water Quality Ordinance Framework

Gilleland Creek Watershed
Water Quality Ordinance Framework

Goal: Limit future bacteria loads to Gilleland Creek from new development and redevelopment by:

1) providing hydrologic control and treatment of post-development runoff.
2) protecting and preserving natural pollutant control systems [riparian buffers and wetlands].
3) directing the placement of wastewater infrastructure away from waterways.

Criteria	Recommended Provisions
Application	**All development activity requiring a site or subdivision permit.**
Stream Buffers	**Current regulations**: • Provide stream buffer setbacks for creek protection. • Provide buffer zones according to drainage area size, such as 100 ft from the centerline of the waterway for Minor drainage areas, 200 ft from the centerline of the waterway for Intermediate drainage areas, and 400 ft from the centerline of the waterway for Major drainage areas. Current drainage area size thresholds for the COA and Travis County are as follows: Minor – 320 acres to 640 acres Intermediate – 640 acres to 1,280 acres Major – 1,280 acres or greater **Future considerations:** Extend headwater protection further upstream in the watershed to better protect the natural drainage areas of waterways and retain/reestablish pollutant removal and channel stabilization functions (both key for bacteria control). **Drainage area size thresholds to be evaluated are as follows**: Minor – 5 acres to 320 acres Intermediate – 320 acres to 640 acres Major – 640 acres or greater **Or,** Provide buffer zones for the fully developed 100-year floodplain plus 25 ft.
Water Quality & Stream Bank Erosion Control Requirements	**Current regulations**: • Provide sedimentation-filtration equivalence per COA Environmental Criteria Manual (Section 1.6.0). • Provide water quality volume per Travis County and COA half-inch-plus standard (Travis County Code § 82.209(g) and COA Land Development Code § 25-8-213B). • Provide a 48-hour drawdown time where applicable (i.e., not applicable to controls such as vegetated filter strips). • Provide for non-erosive discharges at all outflow points from developed areas.

Criteria	Recommended Provisions
Water Quality & Stream Bank Erosion Control Requirements (cont.)	**Future considerations**: • Provide sedimentation-filtration equivalence per COA Environmental Criteria Manual (Section 1.6.0) or system compliant with LCRA Highland Lakes Watershed Ordinance & Water Quality Management Technical Manual, July 1, 2007. • Provide water quality volume per Travis County and COA half-inch-plus standard (Travis County Code § 82.209(g) and COA Land Development Code § 25-8-213B) or LCRA Technical Manual Equation 2.9 to capture runoff from the 1 year, 3 hour storm. • Investigate use of biofiltration media (instead of just sand) or other controls for improved control of bacteria; adjust requirements if warranted. • Investigate optimal water quality volume sizing using extended detention systems for channel erosion (and associated turbidity & bacteria) control; adjust requirements if warranted.
Wastewater Lines	**Current regulations**: • Prohibit wastewater lines in stream buffer zone, except for necessary line crossing. **Future consideration**: • Use Erosion Hazard Zone determination methodology (COA Watershed Protection) to calculate depth of line crossings.
Wetlands	**Current regulations**: • Provide wetlands setback and mitigation protections (e.g., Travis County Code §82.209(c) or COA Land Development Code §25-8-282). **Future considerations**: • Same as existing regulations.
Variances	**Current regulations**: • [COA]: General requirements and procedures for variances are defined in Austin City Code, Title 25, Land Development, Chapter 25-1. • Specific requirements and procedures to water quality ordinances are defined in Chapter 25-8, Subchapter A. • [Travis County:] Austin/Travis County Subdivision Regulations, Title 30, General Provisions and Procedures Chapter 30-1, Appeals, Variances, Special Exceptions and Adjustments, Article 9. • [City of Pflugerville:] Land Usage: Title 15, Subdivision Code, Chapter 156, Variances, Section 156-018. **Future considerations**: • Same as existing regulations.

Definitions

Buffer Zone: Vegetated area free of impervious cover adjacent to a creek or natural drainage way.

Creek: A well-defined channel that can convey running water.

Development: All land modification activity, including the construction of buildings, roads, paved storage areas and parking lots for single-family subdivisions, multi-family, retail, medical, educational, and commercial development. Development also includes any land disturbing construction activities or human made change of land surface including clearing of vegetative cover, excavating, leveling, grading, contouring, and the deposit of refuse, waste, or fill.

Impervious Cover: Impermeable surfaces, such as pavement, sidewalks, or rooftops that prevent the infiltration of water into the soil.

Non-erosive discharges: Conveyance from storm sewer outfalls that does not cause channel, bluff, or stream bank erosion.

Re-development: Any rebuilding, renovation, re-plat of property, revisions, remodel reconstruction of an Existing Development or redesign of an existing development which does not cumulatively increase impervious cover by 10,000 square ft or more.

Variances: A waiver from any requirements of an adopted water quality ordinance. Variances will be granted by the governing body in which the requestor's proposed development is seeking approval.

Wetland: A transitional land between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water and conforms to the Army Corps of Engineers definition" (USACE Wetlands Delineation Manual, Section D, Routine Determinations.

Appendix E.
Support Letters

TRANSPORTATION AND NATURAL RESOURCES
JOSEPH P. GIESELMAN, EXECUTIVE MANAGER

NATURAL RESOURCES & ENVIRONMENTAL QUALITY

411 West 13th Street
Executive Office Building
PO Box 1748
Austin, Texas 78767
(512) 854-9383
FAX (512) 854-4697

September 21, 2010

Dear Ms. Ross:

The purpose of this letter is to express support and pledge our participation in the Gilleland Creek Implementation Plan. Travis County is committed to the reduction of bacteria concentrations in the Gilleland Creek watershed through the approach outlined in the Gilleland Creek Implementation Plan.

Travis County understands the Gilleland Creek Implementation Plan document is a planning tool that contains feasible proposals for bacteria reduction in the Gilleland Creek watershed, that participation in the plan is strictly voluntary, and that, if funding cannot be secured for any of the measures contained in the plan, there is not a legal obligation to comply with the provisions of the plan. Travis County also understands that under 30 TAC §309.2(b), the TCEQ has the legal authority to set effluent criteria stringent enough to protect contact recreation in Gilleland Creek if voluntary measures do not result in the achievement of Water Quality Standards in Gilleland Creek.

As a formal measure of the support of Travis County, please accept the enclosed resolution, passed unanimously (4 – 0) on this date by the Commissioners Court.

Sincerely,

Thomas W. Weber

Thomas W. Weber
Environmental Quality Program Manager
Transportation & Natural Resources Department
Thomas.Weber@co.travis.tx.us

Enclosure

Travis County Commissioners Court

Resolution

WHEREAS, Gilleland Creek is a significant, 31-mile long water course in Eastern Travis County with a drainage area of 76 square miles;

WHEREAS, in 2004, the Texas Commission on Environmental Quality (TCEQ) and the U.S. Environmental Protection Agency (EPA) determined that Gilleland Creek no longer met standards of water quality deemed safe for contact recreation such as swimming, due to elevated levels of coliform bacteria;

WHEREAS, on April 21, 2009, the EPA approved a Total Maximum Daily Load (TMDL) that establishes pollutant loads of bacteria which can be assimilated into Gilleland Creek while still meeting water quality standards;

WHEREAS, the established TMDL will require reductions to existing pollutant loads into Gilleland Creek to meet water quality standards;

WHEREAS, Travis County staff has worked with the TCEQ and local stakeholders to develop a TMDL Implementation Plan (I-Plan) that includes strategies for eliminating or reducing pollutant sources;

WHEREAS, Travis County staff is committed to prioritizing inspections of on-site sewerage facilities (OSSFs) in the Gilleland Creek watershed where the County is the Authorized Agent, and enforcing compliance with regulations when malfunctioning OSSFs are detected;

WHEREAS, Travis County staff is developing revisions to the Travis County Code that, if approved, would harmonize development requirements of the overlapping jurisdictions in the Gilleland Creek watershed and would implement restrictions that would include development setbacks and further storm water treatment; and

WHEREAS, on August 27, 2010, the TCEQ published the proposed Gilleland Creek TMDL I-Plan seeking public input, before considering formal adoption of the I-Plan.

NOW, THEREFORE, BE IT RESOLVED BY THE TRAVIS COUNTY COMMISSIONERS COURT, THAT the Court supports the August 27, 2010, Gilleland Creek Implementation Plan and pledges its participation to implement the strategies identified in the I-Plan.

SIGNED AND ENTERED THIS 21st DAY OF SEPTEMBER, 2010.

Samuel T. Biscoe
SAMUEL T. BISCOE
COUNTY JUDGE

RON DAVIS
COMMISSIONER, PRECINCT 1

SARAH ECKHARDT
COMMISSIONER, PRECINCT 2

Karen L. Huber
KAREN L. HUBER
COMMISSIONER, PRECINCT 3

MARGARET J. GÓMEZ
COMMISSIONER, PRECINCT 4

LCRA
ENERGY • WATER • COMMUNITY SERVICES

September 23, 2010

Mr. Ron Stein
TMDL Project Manager
Texas Commission on Environmental Quality, MC-203
P.O. Box 13087
Austin, TX 78711-3087

Re: Gilleland Creek Implementation Plan

Dear Mr. Stein:

As a steward of the lower Colorado River and its tributaries, the Lower Colorado River Authority (LCRA) extends our support and pledges participation in the proposed Gilleland Creek Implementation Plan to reduce bacteria concentrations identified by the Gilleland Creek Total Maximum Daily Load (TMDL) process. LCRA actively participated in the development of the TMDL for Gilleland Creek, and is committed to assisting with the proposed recommendations of the Implementation Plan to restore water quality in this tributary to the Colorado River.

LCRA understands that implementation of proposed measures in the plan is dependent upon available funding and LCRA is under no legal or financial obligation to comply with the provisions therein. However, LCRA appreciates the efforts and planning that have been put forth thus far and recognizes the importance of restoring water quality in Gilleland Creek. LCRA welcomes the opportunity to participate and utilize any of our existing Water Quality programs that may be of use to the implementation process.

Sincerely,

Bryan Cook

Bryan Cook, Supervisor
Water Quality

P.O. BOX 220 • AUSTIN, TEXAS • 78767-0220 • (512) 473-3200 • 1-800-776-5272 • WWW.LCRA.ORG

City of Austin
Austin Water Utility & Watershed Protection Department
P.O. Box 1088, Austin, Texas 78767

September 24, 2010

Mr. Ron Stein, Program Lead
Total Maximum Daily Load Program
Texas Commission on Environmental Quality
MC-203
P.O. Box 13087
Austin, TX 78711-3087

Subject: Letter of Support for the Gilleland Creek TMDL Implementation Plan

Dear Mr. Stein:

On behalf of the City of Austin, we would like to thank you for the opportunity to show our support for the Gilleland Creek TMDL Implementation Plan. As you know, protection of our water resources is a high priority for the City of Austin and its citizens.

The plan contains six management measures that when put into action may help lower the amount of bacteria in Gilleland Creek. Through this letter, we want to express our commitment to help implement those measures. We recognize that the measures are voluntary and not legally binding on the City, especially where insufficient funding or resources would prohibit their implementation. We also recognize – should the voluntary measures alone fall short of lowering bacteria, that 30 TAC §309.2(b) authorizes the TCEQ to establish effluent criteria to supplement the measures and help to achieve the contact recreation standard for Gilleland Creek.

Thank you again for the opportunity to show our support for the Gilleland Creek TMDL Implementation Plan.

Sincerely,

Greg Meszaros, Director
Austin Water Utility

Victoria Li, Director
Watershed Protection Department

The City of Austin is committed to compliance with the Americans with Disabilities Act. Reasonable modifications and equal access to communications will be provided upon request.