TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

AGENDA ITEM REQUEST

Consideration of an Implementation Plan
for Approval

AGENDA REQUESTED: January 15, 2014

DATE OF REQUEST: December 20, 2013

NAME & NUMBER OF PERSON TO CONTACT REGARDING CHANGES TO THIS REQUEST, IF NEEDED: Charlotte Horn, (512) 239-0779

CAPTION: Docket No. 2013-0852-TML. Consideration for final approval of an Implementation Plan for Two Total Maximum Daily Loads for Dissolved Oxygen and One Total Maximum Daily Load for Bacteria in Upper Oyster Creek. (Ronald Stein, Robert Brush) Project No. 2013-005-TML-NR

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INTEROFFICE MEMORANDUM

To: Commissioners **Date:** December 20, 2013

Thru: Bridget C. Bohac, Chief Clerk

Zak Covar, Executive Director

From: L'Oreal W. Stepney, P.E., Deputy Director
Office of Water

Subject: Docket No. 2013-0852-TML; Project No. 2013-005-TML-NR
Consideration for Approval of the *Implementation Plan for Two Total Maximum Daily Loads for Dissolved Oxygen and One Total Maximum Daily Load for Bacteria in Upper Oyster Creek*

Background and Current Practice: The document *One Total Maximum Daily Load for Bacteria in Upper Oyster Creek* was adopted by the Texas Commission on Environmental Quality (TCEQ) on August 8, 2007, and approved by the United States Environmental Protection Agency (EPA) on September 28, 2007. This Total Maximum Daily Load (TMDL) addressed bacteria in all of Segment 1245, which covers three assessment units (AUs) at this time. The document *Two Total Maximum Daily Loads for Dissolved Oxygen in Upper Oyster Creek* was adopted by the TCEQ on July 28, 2010, and approved by the EPA on September 21, 2010. This TMDL addressed low dissolved oxygen (DO) in two of the three AUs within Segment 1245. 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 addresses both the bacteria and DO TMDLs.

Comments on the I-Plan: One comment was received during the TCEQ public comment period, which took place from September 6 through October 7, 2013. The comment was provided by the Texas Department of Transportation, and reflected a recent policy decision by that agency regarding avian exclusion devices and their infrastructure. This comment required modification of the draft I-Plan. The changes made to the I-Plan clarified and improved the document.

The Water Quality Planning Division now requests that the commission consider approval of the final I-Plan as fulfilling the requirements of the "Implementation and Reasonable Assurances" sections of the TMDLs covered by this I-Plan. Combined with the TMDLs, the I-Plan provides local, regional, and state organizations with a comprehensive strategy for restoring and maintaining water quality in the impaired water bodies.

Scope: Consideration for final approval of the I-Plan for TMDLs corresponding to three AUs in one segment for indicator bacteria and low DO in the Upper Oyster Creek watershed (Segment 1245), of the Brazos River Basin, in Fort Bend County.

Effect on the:

A) Regulated community: Wastewater treatment facilities (WWTFs) in the watershed will receive effluent limits and will monitor for bacteria on a regular basis. Effluent limits are set at the water quality criterion for *Escherichia coli* (*E. coli*; 126 most probable number/100 milliliter (mL)) for WWTFs. Effluent limits for two oxygen-demanding substances (carbonaceous biochemical oxygen demand ($CBOD_5$) and ammonia nitrogen (NH_3-N)) have been set on a permit-by-permit basis using the QUAL2K model developed for this project. All effluent limits are the result of established TMDL requirements, as updated through the Water Quality Management Plan.
B) Public: The public are active participants in the stakeholder process.
C) Agency programs: TCEQ TMDL Program will continue to work with both TCEQ permitting staff and stakeholders to review the progress towards implementing activities in the I-Plan.

The ultimate goal of this I-Plan is the increase of DO and the reduction of indicator bacteria concentrations in Segment 1245 of Upper Oyster Creek to levels that meet the criteria defined in the state water quality standards and in the TMDLs adopted for this segment.

Stakeholder Involvement: The Houston-Galveston Area Council (H-GAC) is providing coordination for public participation related to this I-Plan. After extensive outreach to various groups with a potential for interest in this project, the stakeholders created a Coordinating Committee with 14 members representing a variety of interests in the watershed. Meetings were held monthly between February 2011 and August 2011, and in December 2011. These meetings were all held in the City of Sugar Land. Four workgroups were formed and met monthly subsequent to the Coordinating Committee schedule noted previously, during weeks where there was not a public meeting. Each workgroup had at least one Coordinating Committee member serve, but this was a direct way for both Committee and non-Committee members to be vocal in the decision-making process in a smaller, more focused setting. The Committee members used the information generated during the workgroup meetings to inform the rest of the committee on specific tasks and topics. These four work groups were:

- agriculture and wildlife;
- human waste sources;
- research and monitoring; and
- urban nonpoint sources.

The members of the four work groups developed sections of the I-Plan, which were then compiled into a single document by H-GAC. This I-Plan includes 12

Implementation Strategies (ISs) and 55 Implementation Activities (IAs) that will be used to increase DO and reduce the level of bacteria in Upper Oyster Creek. ISs are general approaches to addressing the causes and sources of impairments. IAs are specific components of each IS. The ISs identified in the I-Plan are:

1. Monitoring: Monitoring provides a basis for evaluating segment conditions and measuring progress.
2. Research: Research activities serve adaptive management aims by providing more precise information regarding the segment. Better understanding of watershed and water quality interactions helps target IAs with greater effectiveness.
3. Continue and Expand Existing Education and Outreach: Excellent education and outreach efforts already exist in the Houston region and within local jurisdictions in the Upper Oyster Creek watershed. To prevent duplication of effort and increase efficiency, this strategy involves coordinating the continuance and augmentation of existing education programs.
4. Implement New Education and Outreach Efforts: Existing educational efforts can be augmented with additional programs and efforts to address specific concerns or aspects of the watershed's impairments.
5. General Nonpoint Source Management: General nonpoint source management refers to activities addressing urban nonpoint source inputs not directly related to permitted Municipal Separate Storm Sewer System (MS4) activities.
6. Urban Municipal Separate Storm Sewer System (MS4) Stormwater Management: Since the completion of the TMDL projects, many local MS4s have become subject to Phase II stormwater permits. Required permit activities are expected to reduce bacterial inputs and improve DO levels by addressing pollutants in urban stormwater outfalls.
7. Agricultural/Livestock Management: Row crop and livestock practices, regardless of the size of the operation, can impact bacteria concentrations and DO levels. These activities seek to utilize existing and expanded programs that have proven to be effective and well received by the agricultural community.
8. Feral Hog Management: Feral hogs represent a growing impact on agricultural production and water quality in Fort Bend County. In addition to sizeable production losses, unchecked feral hog populations produce significant bacteria loads.
9. Avian Wildlife Management: Introduced or domestic avian species can produce concentrated loadings in amenity lakes and other water bodies affecting the segment. Additional wild avian species in colonial nests above the water can impact bacterial concentrations downstream.
10. Wastewater Treatment Facilities (WWTFs): WWTFs have the potential to introduce effluent contaminated with bacteria or compounds contributing to DO impairment. Alternative enforcement practices can reduce discharge volumes and loadings of bacteria and oxygen-demanding substances.
11. Sanitary Sewer Collection Systems: Aging infrastructure can introduce pollutants

into water bodies. Effective management and rehabilitation policies can reduce leaks and overflows.

12. On-site Sewage Facilities (OSSFs): Aging or failing OSSFs (septic systems, aerobic systems, etc.) can be appreciable sources of bacteria, and are not subject to central control like a WWTF or collection system. Identifying and prioritizing the impact of OSSFs in the watershed, while actively working to remediate, replace, or remove failing and at-risk systems can help reduce potential future contamination.

Information on past and future meetings for the Upper Oyster Creek watershed I-Plan is posted on the project Web site *www.upperoystercreek.com* created and maintained by H-GAC.

Potential controversial concerns and legislative interest: There are no controversial concerns or legislative interest at this time.

Key dates in the TMDL I-Plan schedule: The I-Plan identifies responsible parties, technical and financial needs, monitoring and outreach efforts, and a schedule of activities for each of the 55 IAs within the 12 ISs listed earlier. It describes the process that the TCEQ and stakeholders will use to assess progress and adjust the plan periodically. The TCEQ will participate in annual stakeholder meetings, for a maximum time of five years, so that the group can evaluate their progress. The TCEQ and stakeholders will track the progress of the I-Plan using both programmatic and water quality indicators. The TCEQ will report results and evaluations from implementation tracking to stakeholders as needed.

Key Points in the TMDL Proposal Schedule:
Public meeting date: September 19, 2013
Public comment period: September 6, 2013 - October 7, 2013
Anticipated proposal date: January 15, 2014

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Attachments

cc: Chief Clerk, 7 copies

Approved January 15, 2014

Implementation Plan for Two Total Maximum Daily Loads for Dissolved Oxygen and One Total Maximum Daily Load for Bacteria in Upper Oyster Creek

Segment 1245, Upper Oyster Creek

Water Quality Planning Division, Office of Water

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Distributed by the
Total Maximum Daily Load Team
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TMDL implementation plans are also available on the TCEQ website at:
<www.tceq.texas.gov/implementation/water/tmdl/>

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In compliance with the Americans with Disabilities Act, this document
may be requested in alternate formats by contacting the TCEQ at
512/239-0028, Fax 239-4488, or 1-800-RELAY-TX (TDD),
or by writing P.O. Box 13087, Austin, TX 78711-3087.

This report is modeled after the report titled
"Implementation Plan for Seventy-Two Total Maximum Daily Loads for Bacteria in the
Houston-Galveston Region"
prepared by the Houston-Galveston Area Council for the
Texas Commission on Environmental Quality.

The plan is based in large part on the recommendations of the four stakeholder Work
Groups organized by the Houston-Galveston Area Council.

Organizations engaged in the development of this document include:

AECOM

Bayou Preservation Association

Brown & Gay Engineering

City of Fulshear

City of Sugar Land

Edminster, Hinshaw, Russ & Associates

Fort Bend County Drainage District

Gulf Coast Water Authority

Jones & Carter Engineering

Keep Sugar Land Beautiful

Quail Valley Utility District

Schwartz, Page, and Harding

Southwest Water Company

Storm Water Solutions

Sugar Lakes HOA

Texas Commission on Environmental Quality

Texas State Soil and Water Conservation Board

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Acronyms and Abbreviations

AU - Assessment Unit
AWBD - Association of Water Board Directors
BST - Bacterial Source Tracking
BIG - Bacteria Implementation Group
BMP - Best Management Practice
BRA - Brazos River Authority
CAFO - Concentrated Animal Feeding Operation
CBOD - Carbonaceous Bio-chemical Oxygen Demand
COD - Chemical Oxygen Demand
CRP - Texas Clean Rivers Program
DMR - Discharge Monitoring Report
DO - Dissolved Oxygen
EPA - U.S. Environmental Protection Agency
E. coli - *Escherichia coli*
EQIP - USDA NRCS Environmental Quality Incentives Program
ETJ - Extra-Territorial Jurisdiction
FOG - Fats, Oils, and Grease
GCWA - Gulf Coast Water Authority
H-GAC - Houston-Galveston Area Council
I-Plan - Implementation Plan
IA - Implementation Activity
IS - Implementation Strategy
LA - Load Allocation
LID - Low Impact Development
LIDs - Levee Improvement Districts
LDC - Load Duration Curve
MGD - Million Gallons per Day
mL - Milliliter
MOS - Margin of Safety
MPN - Most Probable Number
MS4 - Municipal Separate Storm Sewer System
MUD - Municipal Utility District
NEIWPCC - New England Interstate Water Pollution Control Commission
NELAC - National Environmental Laboratory Accreditation Conference
NRCS - USDA Natural Resource Conservation Service
OSSF - On-Site Sewage Facility
QAPP - Quality Assurance Project Plan
SEP - Supplemental Environmental Project
SSO - Sanitary Sewer Overflow
SSOI - Sanitary Sewer Overflow Initiative of TCEQ
SWCD - Soil and Water Conservation District
TAC - Texas Administrative Code
TCEQ - Texas Commission on Environmental Quality
TDCJ - Texas Department of Criminal Justice
TMDL - Total Maximum Daily Load
TOWTRC - Texas Onsite Wastewater Treatment Research Council

TPDES - Texas Pollutant Discharge Elimination System
TSSWCB - Texas State Soil and Water Conservation Board
TxDOT - Texas Department of Transportation
UA - U.S. Census Bureau-designated Urbanized Area
UAMP- Utility Asset Management Program
USDA - United States Department of Agriculture
WEAT - Water Environment Association of Texas
WLA - Waste Load Allocation
WPP - Watershed Protection Plan
WQMP - Water Quality Management Plan
WWTF - Wastewater Treatment Facility

Acknowledgements

Coordinating Committee of the Upper Oyster Creek TMDL Implementation Plan Group

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Texas Commission on Environmental Quality

This project was funded by TCEQ through the TMDL Program. Numerous TCEQ employees at headquarters in Austin, at the regional office in Houston, and with the Galveston Bay Estuary Program have been essential to the development of the Implementation Plan and its antecedent TMDLs. While there are too many TCEQ employees to list individually, the following staff members were project managers for the TMDLs and the Implementation Plan during the development of the plan.

Mr. Ron Stein, TMDL Program Manager

Mr. Jason Leifester

Ms. Earlene Lambeth

Dr. Linda Broach and Ms. Kimbalyn Laird of the TCEQ Region 12 staff were integral to the development of the plan.

Texas State Soil and Water Conservation Board

The Texas State Soil and Water Conservation Board (TSSWCB), in the person of Mr. Brian Koch, provided valuable expertise and support throughout the planning process.

Houston-Galveston Area Council

H-GAC Project Management and oversight was provided by:

Mr. Jeff Taebel, Director of Community & Environmental Planning

Mr. Todd Running, Water Resources Program Manager

Mr. Justin Bower, Senior Environmental Planner
(*Upper Oyster Creek Project Manager*)

Mr. Jeff Murray, Environmental Planner

Additional assistance was provided by many H-GAC employees, especially Will Merrell, William Bass, Stephanie Beckford, Kristi Corse, Bill Hoffman, Rachel Powers, Heather McTighe, Hilde Leitenbacher, Sandra McKnight, Aubin Phillips, Mary Spain, Andrea Tantillo, and Jean Wright.

Implementation Plan for Two TMDLs for Dissolved Oxygen and One TMDL for Bacteria in Upper Oyster Creek

Executive Summary

Upper Oyster Creek, Segment 1245, comprises all or part of several water bodies, including Jones Creek, Oyster Creek, Flat Bank Creek, a diversion canal, and Steep Bank Creek. It also has several tributaries, including Flewellen Creek and Red Gully. It originates at the Gulf Coast Water Authority's (GCWA) Shannon Pumping Station on the Brazos River south of the City of Fulshear and terminates at the confluence of Steep Bank Creek and the Brazos River, located southeast of the City of Sugar Land.

Elevated levels of indicator bacteria indicate a possible health risk for swimmers and others in direct contact with the waterway. Additionally, low dissolved oxygen (DO) concentrations in some areas of the creek indicate that conditions are not optimal for aquatic life.

After an intensive study of water quality and pollutant loading on Segment 1245, the Texas Commission on Environmental Quality (TCEQ) adopted One Total Maximum Daily Load for Bacteria in Upper Oyster Creek (Segment 1245) on August 8, 2007. This Total Maximum Daily Load (TMDL) was approved by the U.S. Environmental Protection Agency (EPA) on September 28, 2007. On July 28, 2010, the TCEQ adopted Two Total Maximum Daily Loads for Dissolved Oxygen in Upper Oyster Creek (Segment 1245). This TMDL was approved by the EPA on September 21, 2010.

Subsequent to the completion of these TMDL projects, TCEQ engaged the Houston-Galveston Area Council (H-GAC) to create a locally led group of watershed stakeholders (the Upper Oyster Creek TMDL Implementation Plan Group) and facilitate their work on developing an Implementation Plan (I-Plan) for addressing issues identified in the TMDLs. The stakeholders, led by an elected Coordinating Committee and supported by topic-specific Work Groups, met regularly and discussed the project from February 2011 through February 2012. A wide variety of local interests were involved, including local residents, community and conservation groups, local governments, special districts, state agencies, agricultural groups, and private developers. In addition to feedback and review by the Coordinating Committee, H-GAC sought comments from the stakeholders in January and February 2012, after the production of the draft I-Plan document. Subsequent to peer review by TCEQ and TSSWCB staff, H-GAC sought and received stakeholder concurrence on recommended changes.

Purpose of this Implementation Plan

This I-Plan:

- Addresses both elevated bacteria levels and depressed DO levels;
- Documents the stakeholders' year-long effort to evaluate and select meaningful strategies and activities to achieve water quality goals;
- Describes the steps the TCEQ and stakeholders will take to achieve the pollutant reductions identified in the TMDL reports; and
- Outlines the schedule for the selected implementation strategies (ISs) and implementation activities (IAs).

The ultimate goal of this I-Plan is the increase of DO and the reduction of indicator bacteria concentrations in Segment 1245 of Upper Oyster Creek to levels that meet the criteria defined in the state surface water quality standards and in the TMDLs adopted for this segment.

General Implementation Approach

Segment 1245 is undergoing rapid changes to the flow and uses of its component water bodies. The land within the watershed of Segment 1245 is also undergoing rapid changes. The area has been characterized by high rates of land development and conversion from rural and agricultural uses to urban residential and industrial use.

The portion of the segment upstream of Dam 3 in Sugar Land is used as a conveyance for surface water supplies pumped from the Brazos River by the GCWA (See Figure 1 in the Summary of the TMDLs section of this document). This introduced flow can account for a majority of the flow in the system. Fort Bend County Subsidence District regulations will drive an imminent, wide-scale conversion to surface water as a drinking water source in the next five years. To serve this need, the GCWA will need to substantially increase their pumpage, resulting in appreciable changes to the flow regime of the system. It is uncertain how increased volumes and corresponding withdrawals along Oyster Creek, will impact flows, and the impact increased Brazos River water inputs will have on water quality in the segment. Therefore, the stakeholders chose not to immediately implement mandatory control measures other than recommending stronger enforcement of existing TCEQ limits and restrictions.

A five-year period of water quality monitoring was chosen to evaluate the need for implementing stricter effluent limits or similar control actions. However, several efforts have begun to be implemented in the watershed in the intervening years since the original TMDL, and stakeholders have recommended continuing and augmenting these activities with voluntary efforts to address water quality impairments in the interim. To the greatest extent practicable, the stakeholders

have selected IAs that augment existing, effective programs and activities to avoid duplication of effort and ensure the greatest potential for success. Feasibility, the ability to implement multiple-benefit solutions, and a comprehensive approach were highlighted as important guiding principles by the stakeholders. Additionally, the stakeholders have attempted to support, rather than duplicate, activities and efforts of the Houston area Bacteria Implementation Group (BIG).[1] The stakeholders will coordinate with the BIG on activities that will benefit both project areas. Coordination, education, and outreach are highly emphasized components of this I-Plan. All recommended strategies are dependent on availability of funding, and may be adapted to meet changing economic conditions as well as the changing hydrologic and land use character of the watershed.

Bacteria Impairment Source Evaluation and Implementation Strategies

The study culminating in the TMDL for bacteria identified a variety of sources as contributing to the system's bacterial loading, and called for a 73% reduction goal in indicator bacteria concentrations to meet the goal set by the water quality standard. Based on bacterial source tracking (BST), there was no single predominant source. Bacteria specific to humans, avian and non-avian wildlife, and domestic animals all accounted for appreciable portions of the loading. Additionally, the evaluation of monitoring data showed little seasonal fluctuation. Other efforts to evaluate the water quality and applicable uses of this watershed have been conducted concurrently with, or subsequent to, the Bacteria TMDL.[2] Additionally, updates to the TMDLs will be completed on a periodic basis. The current strategies may be impacted by future outcomes of these efforts, and will be evaluated and adjusted by the stakeholders accordingly.

Based on the general implementation approach outlined above, stakeholders recommended that stricter limits on regulated facilities be delayed for a five-year monitoring period. However, they identified a comprehensive suite of voluntary activities to reduce loading that would be implemented in the interim. These implementation strategies address reducing bacterial loading from human waste sources (onsite sewage facilities (OSSFs), wastewater treatment facilities (WWTFs), and sanitary sewer collection systems), agricultural and wildlife sources (focusing on expansion of existing agricultural education and technical assistance programs, feral hog management, and avian bacteria sources), and urban nonpoint sources (including pet waste management and continuation of stormwater activities begun subsequent to the original bacterial study). Accompanying these IAs, the stakeholders proposed a coordinated education and

[1] The BIG is an I-Plan coordinating effort serving four Houston area TMDL projects. Upper Oyster Creek is not part of the BIG area.
[2] A Recreational Use Attainability Assessment study was conducted for Upper Oyster Creek and Bullhead Bayou and an Unnamed Tributary of Bullhead Bayou.

outreach program continuing and augmenting effective efforts already existing in the watershed.

Dissolved Oxygen Impairment Source Evaluation and Implementation Strategies

There is a marked hydrologic difference above and below Dam 3 (Upper and Lower Reach, respectively) in the City of Sugar Land, at which point a large amount of the flow in Oyster Creek is diverted into a surface water supply canal. As the Upper Reach is maintained as a conveyance of surface water for the GCWA, it is periodically dredged to retain this function. Additionally, variable levels of invasive growth of aquatic plants (alligator weed, water hyacinth, etc.) in the Upper Reach, and especially in Assessment Unit (AU) 2, has previously necessitated herbicidal spraying. The TMDL indicates that both dredging and herbicidal spraying may impact DO levels. The Lower Reach is of sufficiently different character (being a shallow, effluent dominated water body), that at the time the TMDLs for DO were being prepared, the Lower Reach required a Use Attainability Analysis (UAA) to be conducted in order to ascertain the correct level of aquatic life use to be supported. Therefore, the Lower Reach was not addressed in the two TMDLs developed for the remaining two AUs in the Upper Reach.[3]

While low DO levels are typically a system response to a variety of oxygen-demanding factors, TMDLs were developed specifically for carbonaceous biochemical oxygen demand (CBOD) and ammonia nitrogen (NH_3-N), focusing on regulated point sources.[4] Although the TMDL indicated no reductions were necessary even under the full permitted capacity of existing permitted discharges, the system's ability to assimilate future discharges is severely limited. Based on growth trends within the watershed, future permitted discharges will be necessary. Additionally, the TMDL calls for the I-Plan to address nonpoint sources. As with WWTF permit limits for bacteria, the lack of mandated reductions and potential impact of stricter permit limits for NH_3-N and CBOD led the stakeholders to focus on nonpoint sources in the initial phase of implementation. They felt that DO levels were more readily addressed through management of nonpoint sources. Therefore, the stakeholders recommended a series of implementation strategies to address a range of oxygen-demanding substances, including an integrated education and outreach component (with a focus on nutrient management), promotion of aeration in the water bodies, oil and waste collection, coordination of dredging and herbicidal treatment between the GCWA and various other Fort Bend County property owners and governmental entities, and

[3] However, many activities identified in this I-Plan will likely benefit both the Upper and Lower Reaches.
[4] While point sources were the focus of the TMDL load assessments, the final TMDL document acknowledges that nonpoint sources of pollutants, as well as the potential of dredging, herbicidal treatment, and changes in flow discussed under the General Implementation Approach section of this summary, may all be contributing factors. Furthermore, the TMDL recommended that these potential factors be assessed during implementation.

additional monitoring and research on impacts of changing flow. It is expected that many of the IAs designated for bacteria, especially those concerning OSSFs (which include septic tanks) and WWTFs, are also likely to impact DO levels.

Evaluating Water Quality Goal Achievement

The full implementation of the strategies and activities described in this I-Plan is expected to reduce bacteria concentrations by 22% (see Appendix D for more information). Because the TMDLs do not require a reduction in the pollutants linked to DO impairment, a percent reduction has not been estimated. However, the narrative in Appendix D describes the potential impact the prescribed strategies have on DO. For both impairments, the method of estimating loading reductions is based on the best available information from literature-based estimates, data from other TMDLs and watershed protection plans.

For both impairments, the TCEQ will track the progress of this I-Plan in restoring the affected uses. Water quality data will be collected for at least 10 years to identify trends and compliance with the water quality standard. The primary means of this assessment will be evaluation of existing Clean Rivers Program (CRP) water quality monitoring conducted by the Brazos River Authority (BRA) and the TCEQ, effluent discharge monitoring conducted by regulated wastewater facilities and the TCEQ, and additional monitoring as necessary to augment existing data. Special attention will be given to water quality results at the end of the five-year preliminary monitoring period, as this milestone has been set as a decision point for considering additional control actions. If standards are not attained by the end of the monitoring period, the stakeholders and TCEQ will reevaluate the TMDL and the I-Plan and take appropriate action.

Introduction

In order to keep Texas' commitment to restore and maintain water quality in impaired rivers, lakes, and bays, the TCEQ will establish implementation plans for each TMDL it develops. 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.

After an intensive study of water quality and pollutant loading on Segment 1245, Upper Oyster Creek, the TCEQ confirmed that the segment had elevated levels of indicator bacteria and depressed DO. These water quality conditions impaired the ability of the segment to support its primary contact recreation (bacteria) and intermediate aquatic life (DO) uses. To address this situation, TCEQ conducted TMDL projects for both impairments, with feedback and participation by stakeholders in the watershed. As a result of these efforts, the TCEQ adopted *One Total Maximum Daily Load for Bacteria in Upper Oyster Creek (Segment 1245)* on August 8, 2007, and *Two Total Maximum Daily Loads for Dissolved Oxygen in Upper Oyster Creek (Segment 1245)* on July 28, 2010. These TMDLs were subsequently approved by the EPA on September 28, 2007, and September 21, 2010, respectively.

The second phase of the TMDL process is the development of an I-Plan as part of a locally led stakeholder effort. The I-Plan is a flexible tool that governmental and nongovernmental organizations involved in implementation use to guide the management of their programs. The participating organizations may accomplish the activities described in this I-Plan through rule, order, guidance, or other appropriate formal or informal action.

The I-Plan document contains the following components:

1) A description of the ISs and IAs that will be implemented to achieve the water quality target.
2) A schedule for implementing activities.
3) A follow-up tracking and monitoring plan to determine the effectiveness of the measures undertaken.
4) 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.
5) Identification of the communication strategies the TCEQ will use to disseminate information to stakeholders and other interested parties.

6) 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 and DO impairment, IS and IA descriptions, estimated potential load reductions to be achieved, technical and financial assistance needed, educational components for each measure, schedule of implementation, measurable milestones, indicators to measure progress, monitoring components, and responsible entities as outlined in the *Nonpoint Source Program Grants Guidelines for States and Territories* (EPA, 2004). Consequently, projects developed to implement unregulated (nonpoint) source elements in this plan that meet the grant program conditions may be eligible for funding under the EPA's Section 319(h) grant program.

This I-Plan is designed to guide activities that will reduce bacteria concentrations and increase DO levels in Segment 1245 (Upper Oyster Creek), as defined in the adopted TMDLs. The ultimate goal of the I-Plan is to restore the primary contact recreation use and intermediate aquatic life use for the segment by meeting the applicable criteria established in the state's water quality standards. Both the *One TMDL for Bacteria* and the *Two TMDLs for Dissolved Oxygen* are addressed by this single I-Plan.

TCEQ engaged H-GAC to facilitate this process, and convened a stakeholder group representing the wide variety of interests in the watershed. This I-Plan is the result of the 15-member coordinating committee convened by the TCEQ, many of whom participated in each of the monthly meetings over the course of one year. The members represented city and county governments, resource agencies, business and agriculture interest, conservation organizations, and consulting and law firms. Members of the coordinating committee and other stakeholder participants developed the recommendations in this I-Plan.

This plan proposes an adaptive management approach to implementation. The EPA describes adaptive implementation as a tool used to improve implementation strategies. Adaptive implementation may be appropriate when there is uncertainty regarding loading, necessary load reductions, and the effectiveness of IAs, as is the case for this I-Plan. Adaptive implementation allows for the implementation of practicable controls while additional data collection and analysis are conducted. Monitoring addresses the uncertainty in the efficacy of implementation actions and can provide assurance that implementation measures are succeeding in attaining water quality standards, as well as inform the ongoing TMDL ISs.[5] The cost-effectiveness of the recommendations in this I-Plan will need to be tested periodically during implementation so the overall strategy can be adapted to emphasize those measures which are working best. The advantage

[5] EPA, 2006

of this approach is that it will avoid major up-front expenditures for untested strategies, but it will also require a sustained investment in monitoring and follow-up communication.

Summary of TMDLs

Three TMDLs[6] were developed by the TCEQ to address the primary contact recreation (bacteria) and aquatic life use (DO) impairments affecting Segment 1245. One TMDL[7] was developed for bacteria for the entire segment, while two TMDLs[8] were developed for DO.[9] The following is a description of the project area, the methodologies employed as part of the TMDL efforts, and their respective findings. Further information can be found in the adopted TMDLs.[10]

Project Area Description

Hydrology

Despite being known as "Upper Oyster Creek," Segment 1245 comprises all or part of several water bodies, including Jones Creek, Oyster Creek, Flat Bank Creek, a diversion canal, and Steep Bank Creek. The segment terminates at the confluence of Steep Bank Creek and the Brazos River. The watershed for this segment also contains two primary tributaries, Flewellen Creek and Red Gully, as well as a variety of other unnamed or minor tributaries. The GCWA maintains a surface water pumping station (Shannon Pump Station) at the furthest upstream point on Jones Creek, from which Brazos River water is introduced into the system in large volumes.[11] From the Shannon Pump Station, flow continues through Jones Creek to Oyster Creek, thence through a series of dammed impoundments to Oyster Creek's confluence with Flat Bank Creek, from Flat Bank Creek to its confluence with a diversion canal, through the diversion canal to Steep Bank Creek, and finally to its confluence with the Brazos River. In its entirety, the Upper Oyster Creek segment covers 54 stream miles and its watershed covers 107 square miles, being wholly contained within Fort Bend County.

In the portion of the waterway that flows through the City of Sugar Land, a series of three dams slows and impounds the Creek at various stages. The dams help create a water right on Oyster Creek, jointly shared by the City of Sugar Land and the GCWA, as well as serving as part of the conveyance system for the GCWA's Brazos River water rights. GCWA's Brazos River water from the Shannon Station

[6] One TMDL for bacteria, Two TMDLs for DO.
[7] TCEQ, 2007.
[8] Representing the two AUs of the Upper Reach. The Lower Reach was addressed through a Use Attainability Analysis (UAA) to determine the proper DO criteria to apply, and thus these TMDLs did not include that AU.
[9] TCEQ, 2010.
[10] Currently hosted, along with subsequent updates, by the TCEQ at <www.tceq.texas.gov/waterquality/tmdl/25-oystercreek.html>.
[11] The GCWA utilizes the Upper Oyster Creek system as a conveyance for surface water. This involves periodic dredging to maintain the depth and character of the channel.

is withdrawn just prior to Dam 3 (at the Second Lift Station) which transfers this surface water to a supply canal (Canal A, or the American Canal). A substantial part of the flow from the upper part of the watershed is either impounded within a series of reservoir lakes in Sugar Land or transferred to the GCWA's supply canal. Therefore, the final dam (Dam 3) marks the transition from the relatively wider and deeper water bodies (Jones Creek and Oyster Creek) to the northwest, and the relatively small and shallow continuation of Oyster Creek to the south. For the purpose of the DO TMDL project, the three AUs of the segment were divided into two hydrologically distinct portions, the Upper Reach (AUs 1245_03 and 1245_02, above Dam 3), and the Lower Reach (AU 1245_01) to reflect this transition. A map of the segment is shown in Figure 1.

Land Use

The watershed consists of a variety of land uses. While the western portion of the watershed exhibits undeveloped and agricultural character, the eastern portion of the watershed exhibits exceptionally rapid urban growth. Barring a general slowing of growth to the Houston region, Fort Bend County, including the Upper Oyster Creek watershed, is likely to continue to experience high growth and development rates. The majority of the undeveloped areas within the watershed are characterized by grassland/coastal prairie and similar open rangeland, although some large parcels of row crop and similar cultivation exist.[12] However, these agricultural areas are expected to continue to be converted to developed land uses based on forecasted growth. The entire Upper Oyster Creek watershed lies within Fort Bend County, which is projected to increase in population by almost 80% between 2000 and 2020.[13] This trend is expected to increase the size of urban areas, and decrease undeveloped lands, rangelands, grasslands, and other areas of agricultural activity.

Political Boundaries

The western and central portions of the County, farther from the core of growth from neighboring Harris County, are primarily unincorporated Fort Bend County areas, or served by municipal utility districts (MUDs) or similar special district developments. The exception is the municipality of Fulshear, in the northwest corner of the watershed. The eastern portion of the watershed is more densely urban, and contains portions of the City of Sugar Land, the City of Missouri City, the City of Stafford, their respective extraterritorial jurisdictions (ETJs) and several clusters of MUDs and master-planned communities on the periphery of the City of Houston's ETJ and the Harris County boundary.

[12] A substantial portion of continuing agricultural activity, in the form of row crop and related non-livestock production, is conducted by the Texas Department of Criminal Justice, at or near their Central Unit facility and adjacent areas in the central portion of the watershed. TDCJ also maintains a swine CAFO in the watershed.
[13] TWDB reference on page 7 in DO TMDL.

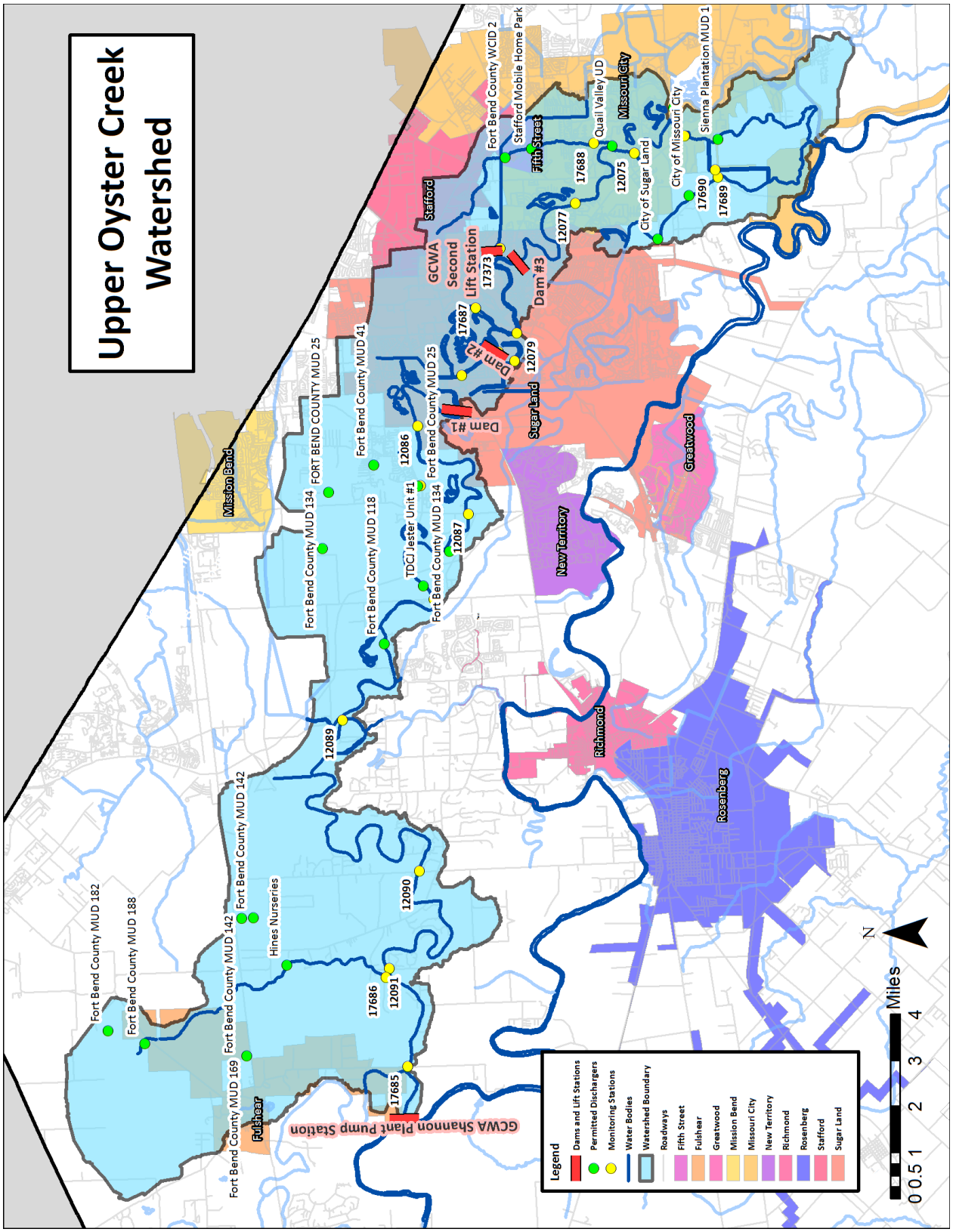

Figure 1. Upper Oyster Creek Project Area

Problem Definition

Based on water quality monitoring data, TCEQ placed Segment 1245 on the 303(d) list of impaired waterways for both contact recreation and aquatic life use impairments in 1996. For the purpose of evaluating the segment, Upper Oyster Creek is broken into three AUs: 1245_01, 1245_02, and 1245_03. AU 1245_01 is the portion of the segment downstream of Dam 3 (referred to in the DO TMDLs as the Lower Reach) and 1245_02 and 1245_03 represent the portion of the segment upstream of Dam 3 (the Upper Reach).

Bacteria Impairment

All three AUs are designated as impaired for primary contact recreation, exhibiting elevated levels of indicator bacteria in excess of state surface water quality standards. The numeric criteria defined in the standards for support of the primary contact recreation use are as follows:

The geometric mean of *E. coli*[14] should not exceed 126 organisms per 100 milliliters (mL) of water.

Using monitoring data and permit information, the TMDLs evaluated the assimilative capacity of Segment 1245. The end result of the TMDL process was a reduction goal of 73% of projected loading.[15]

This TMDL project employed BST to help characterize bacteria loading in the watershed. Bacterial sources originate from both point and nonpoint sources, including:

- WWTF discharges,
- Industrial and construction site discharges,
- Municipal separate storm sewer systems (MS4s),
- Unregulated storm sewer systems,
- Sanitary sewer overflows (SSOs),
- Leaking wastewater infrastructure,
- Dry weather discharges/illicit discharges into and from storm sewers,
- Sediment re-suspension,
- Bacteria regrowth,
- Failing OSSFs,

[14] *E. coli* is the indicator bacteria used to assess the presence of potentially pathogenic organisms related to fecal matter in freshwater segments.
[15] The load allocation scenarios computed the impact to the system of full utilization of existing permitted discharges (waste load allocations), the impact of nonpoint source loading (load allocations), and a margin of safety, to produce a reduction achieved by comparing allowable loading with projected loading.

- Agricultural activities and domesticated animals,
- Wildlife and non-domestic animals, and
- Pets.

The preliminary results of the BST study indicated that the bacteria in Upper Oyster Creek come from a variety of sources, including humans, pets, livestock, and wildlife (avian and mammalian). No particular source group dominated any of the sampling stations,[16] and addressing any one group was unlikely to reduce levels enough to meet the water quality standard. Additionally, no seasonal connection to *E. coli* levels was seen, but bacteria concentrations were higher during runoff events, suggesting that nonpoint sources played an appreciable role in bacterial loading to the segment.

These results suggested that a comprehensive implementation approach, addressing a wide variety of potential sources, would be necessary.

Dissolved Oxygen Impairment

Both upstream AUs (1245_02 and 1245_03)[17] are unable to support an intermediate aquatic life use due to depressed DO levels. Two TMDLs were developed for these AUs.

In general, DO issues may originate from both point and nonpoint sources. These potential factors include:

- WWTF/OSSF discharges,
- Agriculture and urban stormwater runoff (fertilizers and other oxygen-demanding substances),
- Construction site runoff,
- Decay of organic matter (plants, fish, animal matter, lawn clippings),
- Hydrocarbons and other oxygen-demanding chemicals (industrial processes, automobile wear and leaks, waste oil),
- High water temperature, and
- Low aeration.

While the two TMDLs determined a load allocation for nonpoint sources, they did not focus on traditional nonpoint source pollution because a strong relationship of rainfall runoff-derived pollution to the impairment of intermediate aquatic life use was not established. However, the TMDL document indicated

[16] TIAER, 2006.
[17] The Upper Reach. AU 1245_01, the Lower Reach, underwent a UAA, and is not reflected in the adopted TMDLs. If AU 1245_01 receives a TMDL at a later date, this I-Plan will be updated to consider it in coordination with the other AUs of this Segment.

that appreciable nonpoint sources existed in the watershed.[18] Additionally, the TMDLs indicated that other compounding factors (changes in flow due to surface water conversion and GCWA pumping, dredging activities, and herbicidal applications to combat invasive plant species) should be considered in implementation.

While DO is often viewed as a system response to a wide variety of potential causes, these TMDLs were developed specifically for CBOD and NH_3-N, two pollutants strongly related to regulated discharges. The conditions of most concern, based on monitoring data, were critical low-flow conditions. Based on the load allocation scenario evaluations of total projected loading with allowable loading during these flow conditions, the TMDLs indicated no reduction in either of the pollutants was necessary.[19] However, during the evaluated conditions, loadings were at or near the limit of the assimilative capacity in various parts of the Upper Reach. Therefore any additional point source loadings from new regulated discharges or increased discharge from existing facilities must be evaluated on a case-by-case basis to avoid controllable DO conditions.

Both the bacteria and DO TMDLs suggest that future growth and land use transition in the watershed will require stakeholders to address a wide variety of nonpoint source inputs.

Implementation Strategy Development

The ISs and IAs in this document define the approach by which the TCEQ and local stakeholders will address the contact recreation and aquatic life use impairments for Upper Oyster Creek. The ultimate goal for these strategies is to provide a sound, feasible, and comprehensive set of tools to bring Segment 1245 into compliance with water quality standards, and maintain these achievements.

These strategies are the outcome of a year-long, locally led process in which H-GAC and TCEQ facilitated the efforts of watershed stakeholders in identifying potential solutions, defining priorities, and scheduling activities.

Coordinating Committee and Work Groups

Starting in February 2011, H-GAC worked with local leaders and interested parties to bring a diverse array of watershed stakeholders together to participate in this I-Plan project. In the creation of the stakeholder group, and the selection of its Coordinating Committee, emphasis was placed on a well-rounded representation of all the interests in the watershed. The project attracted the attention of a variety of individuals and organizations in the watershed, and the strategies and

[18] Based on these recognitions and the intent of the stakeholders during the I-Plan process, this I-Plan focuses on both point and nonpoint sources.
[19] As with the bacteria TMDLs, waste load allocations for permitted facilities assumed full utilization of current maximum permit limits. Therefore reductions and loading do not represent current loadings, but potential future loadings.

activities represented in this I-Plan reflect the diversity and ongoing commitment of the participants. The Coordinating Committee members, and the respective interests they represent, are listed in Table 1.

The strategy and I-Plan development process was conducted during a series of monthly public meetings of the Coordinating Committee. Subsequent to each meeting, a series of topical Work Group meetings were held to review information and make recommendations for the Coordinating Committee to review. The Work Groups for this I-Plan effort were:

- Agriculture and Wildlife,
- Human Waste Sources,
- Urban Nonpoint Sources, and
- Research and Monitoring.

Implementation Activity Selection

Potential IAs were based on existing, related water quality efforts including local and regional TMDLs and I-Plans, watershed protection plans (WPPs), existing regional and national best management practice (BMP) guidelines and local government water quality initiatives. Bacteria IAs were evaluated first, and then DO IAs. During the discussion of potential strategies, feasibility was an essential portion of the activities selection. The stakeholders generally favored solutions that offered multiple benefits, utilized existing programs (to avoid duplication and because they have proven effectiveness), were likely to be accepted by stakeholders, and were most easily influenced by stakeholder actions. The stakeholders' commitment to implement these strategies for bacteria and DO is rooted in their focus on feasible strategies that have been proven to be effective. For DO specifically, the chosen strategies and activities focus on addressing nonpoint sources rather than recommending immediate changes to permitted discharge limits. This rationale was based on the TMDL requirement to address nonpoint sources in the I-Plan, the changing flow conditions in the Upper Reach, and the desire of the stakeholders to address point sources when and if strategies aimed at nonpoint source management were found to be insufficient or there were appreciable negative changes to DO levels. While the TMDLs do not mandate reductions for DO, the strategies and activities contained here seek to improve current conditions while also mitigating the impact of growth in this rapidly developing watershed.

The stakeholders engaged in a four-part process for selecting and prioritizing the IAs:

- Work Groups discussed the potential ISs/IAs, and added or subtracted ISs/IAs based on local applicability and feasibility.

- The Coordinating Committee selected a suite of ISs/IAs for each impairment based on the recommendations from the Work Groups and their own considerations.
- The Coordinating Committee members were asked to rank the ISs/IAs for each impairment on a survey developed by H-GAC.
- The Coordinating Committee evaluated the prioritization based on their rankings, and voted to accept a final, ranked suite of ISs/IAs.

Table 1. Upper Oyster Creek Implementation Plan Group Coordinating Committee

Coordinating Committee Member	Representing	Interest Represented
Al Abramczyk	Local resident	Residents
David Beyer	Storm Water Solutions	Municipal Stormwater Utilities
Ralph Calvino	AECOM	Residents
Jennifer Elms	Edminster, Hinshaw, Russ & Associates	Water Districts
Vicki Gist	Keep Sugar Land Beautiful	Conservation/Community Organizations
Michelle Kirchner	City of Fulshear	Local Government – Cities
Brian Koch	Texas State Soil and Water Conservation Board	Agricultural Nonpoint Source Abatement
Claudia Notestine	City of Sugar Land	Local Government – Cities
Mitchell Page	Schwartz, Page & Harding, L.L.P.	Districts and Municipalities
Melinda Silva	Brown & Gay Engineering	Water Authorities
Joe Taylor	Quail Valley Utility District	Districts
Michael Thelen	Southwest Water Company	Districts and Municipalities
Mike Thornhill	Southwest Water Company	Districts and Municipalities
Adam Wright	Fort Bend County Drainage District	Local Government – County
Tony Brown/David Sauer	Gulf Coast Water Authority	Water Authorities

The prioritization surveys categorized the activities by specific category and listed them within each of the corresponding Work Group titles. Both the Coordinating Committee and general attendees were encouraged to participate in the survey, which involved scoring each IA between 1 and 5 (1 being judged a less feasible or acceptable activity and 5 being very feasible and acceptable).

After final suites of strategies and activities were developed, project staff looked for overlap between the two impairments. The stakeholders' recommendations emphasize the connection between the two impairments, in which it is assumed that many of the ISs/IAs addressing bacteria (such as those addressing WWTFs) will also impact DO levels by reducing oxygen-demanding materials that accompany bacteria in waste matter. Additionally, stakeholders considered not only the current state of the watershed, but the potential future character of the segment.

Additional Considerations

As tools for consideration of IAs, the stakeholders commissioned two studies by consultants. The first, a review of bacteria and DO monitoring data at BRA sampling stations in the watershed, helped them gauge the change in bacteria concentrations between the initiation of the TMDL sampling effort, and the current day, and the potential impact of efforts already underway in the watershed. The general trend was toward decreased bacteria concentration and sufficient DO levels. The second study was a preliminary assessment of avian and bat populations on local amenity lakes and bridges over the water bodies of the segment. The results of this study indicated few, if any, bat populations, but appreciable swallow and domestic duck populations (potential bacteria sources). The results of both studies helped the stakeholders fine-tune their IA priorities and guide future implementation.

To the greatest extent practicable, the stakeholders have selected IAs that augment existing, effective programs and activities to avoid duplication of effort and ensure greatest potential for success. Additionally, the stakeholders have attempted to support, rather than duplicate, activities and efforts of the BIG that will also benefit this segment. Coordination, education, and outreach are highly emphasized components of this I-Plan. All recommended strategies are dependent on availability of funding, and may be adapted to meet changing economic conditions as well as changing hydrologic and land use character of the watershed.

Implementation Strategies and Activities

This plan documents 12 ISs and 55 IAs to reduce bacteria loads and increase DO levels. These solutions were selected based on feasibility, costs, support, and timing. IAs will be implemented in phases based on the needs of the stakeholders and the progress made in improving water quality.

ISs are general approaches to addressing the causes and sources of impairments. IAs are specific components of each IS. For ease of reference, the ISs and their component IAs are grouped in five general categories corresponding to the Work Groups established in the project. Education and Outreach is described as a separate category, but it is intended to integrate with each other category as a coordinated program.

For ease of reference, an indication of whether each IS/IA is intended to address bacteria, DO, or both is appended to its description.[20] Additionally, the matrix in Appendix E provides a summary of which impairment each IA addresses, and the chosen schedule for that activity. The priority ranking of activities for both bacteria and DO are reflected in the section below. The hierarchy of BMPs is divided by category (Work Groups), IS (sub-categories), and IAs (specific BMPs). Because the IAs are sorted by IS, the activities are listed accordingly (1.1, 2.1, etc., are the most desirable for each strategy).

For each IA, the implementation schedule and funding needed is indicated. For those activities that indicate no funding is needed, minimal staff time and ancillary costs are considered background costs and not included. For example, coordination with the BIG's BMP database (IA 1.1) would take some small amount of staff time to receive and forward data. However, it is unlikely that additional funding will be necessary for any party, so the IA is listed as having no funding need. Schedules and funding are based on best information currently available and may change depending on funding changes, implementation progress, etc.

A table (Table E.1) of all strategies, IAs, costs, and schedule can be found in Appendix E, along with the relationship of all proposed activities to different facets of the Plan's comprehensive approach.

Contact recreation and aquatic life use impairments in Upper Oyster Creek will be addressed through the ISs and IAs described in the following categories.

All activities listed in this I-Plan are based on current projected growth rates, economic assumptions, and budgetary restrictions. Not all activities need to be implemented to meet established load reduction goals. The list of strategies and activities may vary, based on the principles of adaptive management, to accommodate changes in logistic, budgetary, and effectiveness factors, as reassessed in the future.

Monitoring and Research

Monitoring and research strategies and activities address data needs to focus implementation efforts and track results.

Implementation Strategy 1.0: Monitoring

Monitoring provides a basis for evaluating segment conditions and measuring progress.

[20] It is expected that many strategies addressing bacteria specifically will have indirect benefits for DO. However, to take a conservative approach, load reductions were based only on those strategies for which direct impact on DO could be linked.

Implementation Activity 1.1: Support BIG Regional BMP Database Effort

Bacteria

Support the BIG's development of a regional BMP database for the purpose of evaluating the efficiency of potential BMPs. H-GAC project staff will provide technical support to database creation efforts, data for incorporation in the database, and letters or other measures of public support for the broader implemen-implementation of the database, as appropriate to the aims of the Upper Oyster Creek TMDL project. Submit information to the database about BMPs developed under, or in relation to, this project.

****Implementation Schedule***: The BIG will continue to develop the regional BMP database for the foreseeable future. While that effort is ongoing, H-GAC Upper Oyster Creek project staff will assist as able. Additionally, project staff may seek support and advocacy from the project Steering Committee or partner with elected officials as appropriate. In return, information contained in that database will be a useful resource for BMP implementation, monitoring, and evaluation.

****Funding Requirement***: None

Implementation Activity 1.2: Review DMR/SSO Data over the Next Five Years

Bacteria

Collect discharge monitoring report (DMR) data for permitted dischargers in Segment 1245, and SSO data for WWTFs in the watershed over the next five years. Acquire and evaluate data at least once every two years.[21]

****Implementation Schedule***: H-GAC currently acquires the data from the TCEQ and evaluates for other projects, so this activity can be incorporated into that process. The data will be analyzed over the course of the next five years (2017), and if necessary, that process can continue longer into the future.

****Funding Requirement***: None

Implementation Activity 1.3: Continue Ongoing Monitoring Activities

Bacteria and DO

Recommend that ongoing monitoring activities continue. Identify and support the inclusion of additional monitoring locations if necessary based on data results.

[21] The intent of this activity is to provide information for decisions concerning prioritization of efforts related to bacteria sources. The extent to which permitted discharges or sanitary overflows are contributing sources as the watershed continues to develop may influence to what degree implementation focuses on these sources. This information will also influence future consideration of potential control actions regarding sanitary discharges, and help to evaluate effectives of implementation activities targeting these sources.

- Recommend the BRA and the TCEQ continue to monitor their CRP sites on the Upper Oyster Creek system, and recommend that they add CBOD and NH_3-N as is feasible under monitoring budgets and time constraints.
- Recommend that MS4 Phase II permits implement any existing or planned sampling.
- Recommend that Texas Department of Criminal Justice (TDCJ) continue ongoing monitoring of their swine[22] Concentrated Animal Feeding Operation (CAFO), and coordinate with H-GAC and TCEQ on future data needs[23].
- Recommend that the Texas Stream Team program continue to support and collect data from volunteer monitors in the watershed to augment other data sources. Specific attention will be paid to site observations.

****Implementation Schedule***: Monitoring will continue for the foreseeable future.

****Funding Requirement***: No additional funding outside of existing funding sources is necessary for existing monitoring activities. If CBOD and NH_3-N are added, additional funding through CRP will be required. If CRP or BRA funding availability for these items changes, additional funding will be necessary dependent on the level of change.

Implementation Activity 1.4: Adopt More Rigorous Bacteria Monitoring Frequencies

Bacteria

Recommend to dischargers that bacteria monitoring frequencies match other routine sampling frequencies for WWTFs. For some facilities, bacteria monitoring is not conducted as regularly as other required sampling. Conducting them in unison allows for better evaluation of relationships between the data, and provides a more complete picture of discharge efforts.

****Implementation Schedule***: There is no schedule for the implementation of this activity. As opportunities and/or desire arise, adopting more rigorous monitoring may have to be requested when each facility's permit is renewed. In that case, it will take up to five years for all facilities to change their monitoring procedures.[24]

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[22] It should be noted that in all locations in this document in which the TDCJ operation is discussed, or swine are discussed in relation to it, the discussion is in regard to domesticated pigs and not feral hogs.

[23] This monitoring is required by permit and is already occurring. However, the stakeholders felt it was important to reflect all data sources in the watershed, and highlight the potential for cooperation on potential specific research in the future.

[24] There are 20 permits that are being tracked in the watershed at this time for bacteria limits, based on the latest WQMP update. Of those 20, 13 have bacteria limits or monitoring. The other seven are either currently inactive, being processed, or set to expire by 12/1/13. As permits are renewed, bacteria monitoring/limits are being added.

*__*Funding Requirement*__: Increased monitoring will result in each facility incurring some amount of cost based on the change in frequency of their testing.

Implementation Activity 1.5: Conduct Additional Monitoring

DO

Conduct additional monitoring, including:

- 24-hour DO monitoring, correlated to flow, temperature, and other applicable parameters, in various locations to represent current conditions in the three assessment-unit reaches,
- Characterizing nutrient loading, and
- Evaluation of chlorophyll-a/biochemical oxygen demand (BOD)/chemical oxygen demand (COD) as needed based on existing data.

All potential monitoring efforts will consider drought conditions, and, to the greatest extent practicable, take place under the auspices of a quality assurance project plan (QAPP).

*__*Implementation Schedule*__: In the next five years (2017), at least one watershed-wide monitoring study each will be conducted for 24-hour DO monitoring, nutrient loading, and chlorophyll-a/BOD/CBOD. Before the study is conducted, ample time to develop and receive approval for the QAPP should be allotted.

*__*Funding Requirement*__: There is currently no funding available for a DO study. Funding will be needed in order to hire a contractor to conduct the DO monitoring and analyze the data. It may be possible for H-GAC staff to develop the QAPP for the study.

Implementation Activity 1.6: Provide Flow Data Capability

DO

Implement instantaneous flow measurement capability to provide better flow data on Upper Oyster Creek. The segment currently lacks a USGS flow gauge or similar tracking method. Work with stakeholders to identify and implement a feasible option (v notch in weir, staff gauge, etc.) and locate a representative site in each assessment reach.

*__*Implementation Schedule*__: A suitable location will be determined and flow measurement equipment will be installed in each assessment reach on Upper Oyster Creek in the next five years (2017).

*__Funding Requirement__: Stakeholders must find a suitable organization to be responsible for the equipment and maintenance. Funding may be provided by that organization, or other outside funding must be allocated.

Implementation Strategy 2.0: Research

Research activities serve adaptive management aims by providing more precise information regarding the segment. Better understanding of watershed and water quality interactions helps target IAs with greater effectiveness.

Implementation Activity 2.1: Evaluate Potential Flow Regime Changes

Bacteria and DO

Work with GCWA and other surface water users (City of Sugar Land, City of Missouri City, etc.) in the watershed to collect data regarding future pumping changes and withdrawals. Seek funding to model the potential impact of flow regime changes on bacteria and DO levels.

*__Implementation Schedule__: Preliminary work has already been done with Brazos River pumping data from GCWA. Additional data from cities along the waterway can be collected in the future. A study will be completed to provide an outlook on pumping effects on Upper Oyster Creek.

*__Funding Requirement__: No additional funding is necessary to provide data for the study. In order to provide more in-depth analysis than can be done by H-GAC staff, funding for modeling/analysis must be acquired.

Implementation Activity 2.2: Assess Avian and Bat Populations

Bacteria

Conduct an assessment of the spatial distribution, seasonal variability, and population estimates for targeted avian and bat species.[25] Avian species of primary concern are: swallow colonies under bridges over the waterway, pigeons, and

[25] The role of wildlife in the deposition of *E. coli* is not well understood. Although water quality studies incorporate wildlife data, the data often lack a clear connection between wildlife density and *E. coli* deposition. Minimal understanding of species-specific fecal pollution and the role of species density on water quality complicates attempts by natural resource managers to adjust wildlife populations to improve water quality. There is a broadly recognized concern that direct deposition of fecal material from bird and bat species inhabiting bridges spanning waterways can contain bacteria concentrations multiple orders-of-magnitude higher than relevant water quality criteria. This concern of higher pollutant levels is especially pertinent regarding bacteria sampling where collection of water samples is from a bridge or in proximity to a bridge. To address this issue TSSWCB is funding a project entitled *Instream Bacteria Influences from Bird and Bat Habitations of Bridges* to test the hypothesis that bridges containing significant numbers of roosting and nesting birds and bats increase ambient bacteria concentrations of streams under low flow conditions as compared to the situation where roosting and nesting is absent. The results of this project have the potential to prove or disprove sampling bias for bacteria collected from bridge locations under certain environmental conditions. Further, the results of the project have the potential to inform the selection of stream sampling locations in future projects to minimize potential biases in bacteria results and aid in the identification and quantification of other sources contributing fecal pollution to water bodies. While this project is not being conducted in the Upper Oyster Creek watershed, its results may inform future implementation activities of this I-Plan through adaptive management.

domestic (including Muscovy) ducks. Bat populations will be assessed to ensure no action taken under other IAs affects protected populations.[26]

****Implementation Schedule***: Preliminary work was done in 2011[27] to identify both the presence of birds and bats nesting under bridges along Upper Oyster Creek and ducks in several of the many amenity ponds in the watershed. Further investigation will be done in the next five years (2017) to assess the actual population and distribution of individual species. The outcome of this assessment, as supplemented by other studies (see footnote 26), will inform the decision on whether/how to move ahead with IS 9.0.

****Funding Requirement***: Like the preliminary avian populations study completed in 2011, a contractor must be hired to complete the study. There is currently no funding in place to pay for this project, so additional funding must be acquired to complete the study. If modeling or analysis is to be done with the data, that will also require additional funding. Based on the cost of the original study it is expected this study would cost approximately $10-15,000.

Implementation Activity 2.3: Evaluate Future Sampling Data

Bacteria and DO

Continue to work with the BRA and TCEQ to acquire sampling data. Evaluate data every year for trends in bacteria geometric means and DO concentrations, along with any non-ambient or other sampling conducted. Evaluate the data for nutrients (NH_3-N and other nitrogen and phosphorus compounds as appropriate) and other constituents of concern (CBOD, etc.) with respect to DO and bacteria levels. DMR data and SSO data collected under IA 1.2 will be evaluated against ambient water quality data to determine if there is an observable relationship between higher bacteria and nutrient data and incidences of SSOs. Augment with observations and data from Texas Stream Team.[28]

****Implementation Schedule***: Any new sampling data from BRA and TCEQ for Upper Oyster Creek can be incorporated into the data evaluation that is already done by H-GAC. The two parameters (bacteria and DO) are already analyzed as part of the Basin Summary Report, so any additional analysis can be included. This data analysis will be completed every year.

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[26] Preliminary assessments completed as part of decision-making processes for this I-Plan, as well as comments from the Texas Department of Transportation (TxDOT) stakeholders, indicate that TxDOT bridges are not conducive to bat colony formation. The assessment will consider these factors and seek input from TxDOT in its implementation. The assessment will note where structural design renders bat colonies unlikely.

[27] H-GAC contracted with SWCA Consultants to conduct a preliminary study of avian and bat populations on or immediately adjacent to bridges over the water bodies in the watershed. The study found little immediate evidence of bats, but ample evidence of seasonal swallow colonies. Duck populations at representative amenity ponds were also sampled. A copy of this study is available at <www.upperoystercreek.com/projectdocuments.html>.

[28] While Texas Stream Team data serves a dual role as an education and outreach activity and volunteer data collection, it can provide significant data for areas not routinely sampling. Site observations or dramatic shifts can alert other monitoring projects of potential sites for future study.

*__*Funding Requirement*__: No additional funds will be needed because all analysis will be done by H-GAC staff.

Education and Outreach

Education and outreach activities form the link between Coordinating Committee-identified activities and general public participation in implementation. Engaging the public is the key to maintaining water quality gains over the long-term planning future.

Implementation Strategy 3.0: Continue and Expand Existing Education and Outreach

Excellent education and outreach efforts already exist in the Houston region and within local jurisdictions in the Upper Oyster Creek watershed. To prevent duplication of effort and increase efficiency, this strategy involves coordinating the continuance and augmentation of existing education programs.

Implementation Activity 3.1: Deliver the Lone Star Healthy Streams Program Feral Hog Component

Bacteria/DO

The Lone Star Healthy Streams Program Feral Hog Component (LSHS) is a coordinated and comprehensive education program designed to increase awareness of the water quality issues associated with feral hogs (an invasive species), and understanding of control techniques designed to abate feral hogs and reduce their pollutant loading to streams. LSHS is implemented through a partnership between the Texas AgriLife Extension Service, the Texas Water Resources Institute, and the TSSWCB. LSHS will be delivered via local workshops in priority watersheds across the state (including Upper Oyster Creek) and computer-based trainings. Implementation of LSHS is designed to promote the control of feral hogs and increase the utilization of technical assistance available to landowners to abate water quality impacts of feral hogs. More information on LSHS is available at <http://lshs.tamu.edu/>.

Concurrent with the development of the LSHS curriculum, and utilizing CWA Section 319(h) grants from TSSWCB and USEPA, AgriLife Extension produced a series of over a dozen factsheets addressing various aspects of feral hog management, some with Spanish translations. While this series of publications is targeted to landowners in another watershed, they have statewide applicability to watersheds impacted by feral hogs, including Upper Oyster Creek. Some of the topics include: Recognizing Feral Hog Sign; Corral Traps for Capturing Feral Hogs; Feral Hogs Impact Ground-nesting Birds; Feral Hog Laws and Regulations in Texas; Feral Hog Transportation Regulations; and Using Fences to Exclude Feral Hogs from Wildlife Feeding Stations. More information on this series of factsheets is available at <http://plumcreek.tamu.edu/FeralHogs>.

*__*Implementation Schedule*__: Development of the LSHS curriculum has recently been completed and piloted in several watersheds. At least two LSHS Feral Hog workshop should be held for landowners in the Upper Oyster Creek during the next five years (2017).

*__*Funding Requirement*__: The development and delivery of the LSHS Program has been supported through CWA Section 319(h) grants from TSSWCB and USEPA. TSSWCB and AgriLife Extension anticipate that additional grant funding will be necessary to deliver LSHS Feral Hog in future years to landowners in the Upper Oyster Creek watershed.

Implementation Activity 3.2:
Continue and Expand Existing Urban/Suburban Education and Outreach

Bacteria/DO

Continue and seek opportunities to expand the robust existing mix of educational programs aimed at urban nonpoint source pollution. Keep Sugar Land Beautiful (KSLB) and the Phase II National Pollutant Discharge Elimination System (NPDES) regulated entities in the watershed are priority education providers, and the Association of Water Board Directors (AWBD) is a priority target audience. Entities conducting education will be encouraged to coordinate and focus on bacteria (and DO) related issues if they do not do so already. These programs include:

- KSLB education and outreach programs, including trash reduction, environmental education, pet waste education, urban forestry, etc.,
- Municipal/District water conservation, pet waste, and other related programs,
- Independent School District middle school water quality curriculum,
- Water Education for Teachers (WET) in the City/Wild in the City training activities, and
- North Fort Bend Water Authority water conservation and related education efforts.

*__*Implementation Schedule*__: There is no pre-determined timeframe for implementing existing urban/suburban educational programs. The goal of this activity is to show that the stakeholders promote the continuation and expansion of these programs. They are a valuable tool to improve water quality, so they should remain an active implementation activity in the watershed throughout the I-Plan implementation phase. Other state or regional entities other than the local programs listed above are potential elements of this IA, based on their availability, interest, and funding situation, and will be pursued on an opportunity basis.

*__*Funding Requirement*__: Since this activity only includes programs that already exist, there is no additional funding required.

Implementation Activity 3.3:
Expand Livestock Education Programs

Bacteria/DO

Utilize existing educational programs to educate watershed residents on livestock management, etc. via programs like the TSSWCB's LSHS Program Grazing Cattle Component. The LSHS Program Grazing Cattle Component is a coordinated and comprehensive education program designed to increase awareness of the water quality issues associated with grazing cattle, expand the overall knowledge of how to improve the management of grazing lands by landowners, and encourage voluntary implementation of BMPs to reduce the runoff of bacteria from grazing livestock operations. LSHS will be delivered via local workshops in priority watersheds across the state and computer-based trainings. Implementation of LSHS is designed to promote the adoption of BMPs and increase the utilization of technical assistance and financial incentives available to landowners to voluntarily implement BMPs targeted to manage the impact of grazing cattle. The Horse Component is also a valuable education tool for horse owners in the watershed, and may be implemented if there is enough interest. More information on the LSHS Program is available at <http://lshs.tamu.edu/>. To the extent practicable, involve youth-oriented organizations and programs (Future Farmers of America (FFA), 4-H, school farms, etc.) through coordination with AgriLife.

*__*Implementation Schedule*__: Development of the LSHS curriculum has recently been completed and piloted in several watersheds. At least two LSHS Grazing Cattle workshops should be held for landowners in the Upper Oyster Creek during the next five years (2017). LSHS is implemented through a partnership between the Texas AgriLife Extension Service, the Texas Water Resources Institute, and the TSSWCB. Stakeholders will consider implementation of other programs or opportunities to work with the several school districts with FFA/4-H programs in the watershed on an opportunistic basis.

*__*Funding Requirement*__: The development and delivery of the LSHS Program has been supported through CWA Section 319(h) grants from TSSWCB and USEPA. TSSWCB and AgriLife Extension anticipate that additional grant funding will be necessary to deliver LSHS Grazing Cattle in future years to landowners in the Upper Oyster Creek watershed. Additional programs pursued under this IA will require additional funding or in-kind services based on opportunity.

Implementation Activity 3.4:
Continue and Expand Stream Team Volunteer Sampling

Bacteria/DO

Currently the City of Sugar Land has volunteer water quality samplers with the Texas Stream Team program. Volunteer monitoring under the Stream Team program will expand to other urban areas in the watershed (Pecan Grove, Missouri City, Stafford, various other MUDs, etc.) as is feasible. These efforts will be coordinated with the BRA.

****Implementation Schedule***: In order to more fully cover the volunteer monitoring efforts in these urban areas, at least five new volunteers will be added to the current number of Texas Stream Team samplers. These volunteers will be added over the course of the next three years (2015).

****Funding Requirement***: Texas Stream Team is currently funded in the H-GAC region through the CRP.

Implementation Strategy 4.0:
Implement New Education and Outreach Efforts

Existing educational efforts can be augmented with additional programs and efforts to address specific concerns or aspects of the watershed's impairments.

Implementation Activity 4.1:
Implement New Urban/Suburban Educational Efforts

Bacteria/DO

Implement new educational/outreach activities to complement existing activities.

- Maintain an Upper Oyster Creek watershed website[29] as an outlet for educational activity, materials, and outreach. Consider a Facebook page for announcements.
- Produce materials and literature for landscape companies regarding blowing leaves/other material down storm drains, based on existing model programs (e.g., City of Sugar Land Green Waste program).
- Hold workshop(s) in urban areas concerning pet waste management based on existing programs.
- Coordinate outreach activities and education by forwarding announcements to existing communication networks, including AWBD, homeowner association (HOA) newsletters, websites, etc.
- Coordinate with other existing educational activities (e.g., Fort Bend Subsidence District Waterwise, Safe Water Texas, etc.).

[29] www.upperoystercreek.com

- Educate municipalities and private owners about emerging bacteria risks like "splash pad" water play areas without disinfected recirculation or with direct connections to the stormwater system.

****Implementation Schedule***: Many elements of this activity do not have a set implementation schedule due to the varying programs that can be implemented. Some parts of this activity should be maintained throughout implementation, such as maintaining a website, while others can be implemented periodically over the coming years, such as producing new educational materials and workshops. However, at least one new program will be implemented by 2017, and another new program will be implemented by 2022.

****Funding Requirement***: Because this activity involves the development of new educational and outreach programs, funding will be required. It is possible that other organizations may be able to take on some costs for program development, but that, too, will require funding.

Implementation Activity 4.2:
Conduct Residential OSSF Education Program(s)

Bacteria/DO

Conduct an educational outreach effort(s) designed to target residential properties, in areas with OSSF concentrations, for OSSF education; support H-GAC efforts to produce and implement training for home inspectors/real estate personnel for point-of-sale OSSF inspections.

****Implementation Schedule***: In the next five years (2017), at least one OSSF maintenance training workshop will be conducted in the watershed. It is likely that these workshops could be scheduled on a more regular basis if there is enough demand.

****Funding Requirement***: Currently, no additional funding is necessary to hold an OSSF maintenance training workshop. H-GAC has worked with AgriLife and other entities to develop or facilitate OSSF trainings in the past, utilizing staff time without significant funding expenditure.

Implementation Activity 4.3:
Hold Lawn Maintenance Workshop

Bacteria/DO

Partner with AgriLife Extension, or other workshop provider to hold lawn maintenance workshops that focus on monetary as well as environmental benefit of good lawn maintenance techniques.

****Implementation Schedule***: At least one lawn maintenance workshop will be held in the next five years (2017). If successful, it may be possible to hold the workshops on a more regularly occurring basis.

*__Funding Requirement__: If a workshop is held at a retail home improvement store, additional funds may not be needed. To the greatest extent possible, existing materials will be used.

Implementation Activity 4.4: Hold Benefit Concert

Bacteria and DO

Hold benefit concert in coordination with the new minor league baseball stadium or similar venue, other Phase II communities, development and corporate community, etc. to promote reduction of nonpoint source contributions to the waterway (e.g. "Concert for the Creek"). The primary goal of the benefit concert is to maximize outreach efficiency by reaching a large audience all at once, and to generate revenue for additional implementation based on potential agreements with venue owners.

*__Implementation Schedule__: The minor league baseball stadium opened in spring 2012, and has already hosted similar benefit events. H-GAC project staff will work to hold a benefit or outreach event by 2014.

*__Funding Requirement__: A concert of this magnitude will incur a significant cost, but a large portion of that cost can be offset with sponsorships. It would be imperative to seek corporate sponsorships in order to hold a benefit concert. Based on similar benefit events, it would not be expected that state or local government funding would be used for this IA.

Urban Nonpoint Sources

Urban nonpoint sources include a variety of human activities in urban and suburban settings that lead to bacteria and DO impairment. Existing and new regulated stormwater utilities will coordinate their programs with I-Plan efforts. In addition to regulated stormwater activities, stakeholders will implement general good housekeeping practices and look for opportunities to actively coordinate with new development.

Implementation Strategy 5.0: General Nonpoint Source Management

General nonpoint source management refers to activities addressing urban nonpoint source inputs not directly related to regulated MS4 activities.

Implementation Activity 5.1: Coordinate with New Development

Bacteria

Work with developers and local government to promote consideration of incorporating design elements that reduce, impede, filter, or otherwise address runoff

as a contributor to bacteria loading in new development. Coordinate with the North Fort Bend Water Authority and other regional entities on similar efforts.

*****Implementation Schedule***: H-GAC project staff will work with the various entities as an ongoing process. Prior to 2017, H-GAC will work with local governments to produce appropriate materials. Between 2017 and 2022, H-GAC will work in coordination with local entities to coordinate with two new developments or redevelopment projects.

*****Funding requirement***: No additional funding is required for this activity, as H-GAC staff, along with other organizations, will communicate as necessary with developers and other government entities. For BMPs or related projects identified and selected as part of this coordination effort, private or public funding sources will need to be identified, including 319(h) funds where appropriate. Funding sources will be dependent on the nature of the BMP/project and the entity undertaking it. Educational materials exist from a variety of sources, including AgriLife Extension (Sea Grant).

Implementation Activity 5.2: Coordinate Dredging and Invasive Plant Management

DO

Work with GCWA and other Fort Bend County landowners and governmental entities (City of Sugar Land, Fort Bend County Drainage District, et al.) to coordinate on management of the Upper Reach through maintenance dredging and invasive plant management. The TMDLs indicate both dredging and herbicidal treatment may impact DO levels in the segment, and both practices involve coordination between overlapping jurisdictions, especially as part of surface water supply relationships. This IA would facilitate coordination of related efforts between these parties, including scheduling and role assignment as appropriate.

*****Implementation Schedule***: At least one coordination meeting will be held between the City of Sugar Land, the GCWA, the Fort Bend County Drainage District, and other appropriate entities to discuss future maintenance plans for the Upper Reach by 2013. H-GAC will provide ongoing facilitation as appropriate.

*****Funding Requirement***: No funding is required for the coordination aspect of this IA. Individual stakeholders may incur, or continue to incur, costs related to the associated activities (dredging, herbicidal spraying).

Implementation Activity 5.3: Support Working with TCEQ to Allow Water Quality Feature Reimbursement

Bacteria

Support efforts by the BIG to work with TCEQ staff on interpreting existing policies to facilitate reimbursement for water quality features (e.g. wet bottom

detention, etc.) that are currently categorized as recreational/amenity. This would include any water quality features not currently reimbursable, and for which there is mutual agreement on their bacteria-reducing potential (e.g. wet bottom detention facilities). H-GAC project staff will provide technical support for these efforts as needed.

****Implementation Schedule***: H-GAC project staff and stakeholders will provide assistance to the BIG's effort as needed. The BIG intends to seek a letter of commitment from the TCEQ on this matter within three years of the approval of their I-Plan (2012-2014).

****Funding Requirement***: No additional funding is necessary beyond staff time. H-GAC staff will provide assistance to the BIG as needed for this effort.

Implementation Activity 5.4:
Recommend Expansion of Dog Parks and Installing Dog Waste Stations

Bacteria

Recommend municipalities and other entities in the watershed include dog park areas or dog waste stations (in existing and new park areas and public spaces like walking trails) as is appropriate to public use patterns and maintenance logistics. H-GAC will work with municipalities to provide or secure planning support as appropriate.

****Implementation Schedule***: At least one dog park or dog waste station in a public area should be constructed or installed in the watershed in the next five years (2017). This is a reasonable expectation since there is one city-owned dog park in the watershed (City of Sugar Land), and an identified need in the community. Project stakeholders, including the City of Sugar Land, indicated that this was, and would continue to be, a consideration in their Parks planning processes. H-GAC will work with these entities to facilitate this process as appropriate.

****Funding Requirement***: Funding will be necessary, but likely only for the entity that assumes responsibility for constructing and maintaining the park or waste station(s). The stakeholders' role may only entail voicing the desire, suggesting location, and conveying the benefits of the park or waste station(s) to the responsible entity(ies). TCEQ 319(h) funding may be appropriate for some activities under this IA.

Implementation Activity 5.5:
Promote Aeration Reimbursement

DO

Work with TCEQ and Fort Bend County to identify aeration (fountains, etc.) as a reimbursable water quality feature, including the development or approval of low

impact development (LID) standards on a county level (similar to Harris County LID standards).

*****Implementation Schedule***: H-GAC project staff and I-Plan stakeholders will formally petition TCEQ by the end of 2014. Further action will be dependent on TCEQ decisions on this matter.

*****Funding Requirement***: H-GAC project staff and stakeholders will assist TCEQ and other involved entities as necessary. No further funding is needed. Actual aeration feature projects are referenced in IA5.6.

Implementation Activity 5.6: Add Aeration Capacity to Waterways

DO

Study the potential to add aeration at strategic points on the water bodies. Work with local development community and local governments to identify and secure appropriate sites for aeration (passive or active), and identify funding mechanisms to implement aeration projects.[30] The purpose of this IA is both to address existing conditions and to mitigate the impacts of future growth on DO levels.

*****Implementation Schedule***: Aeration will be added in at least one location in the next ten years (2022).

*****Funding Requirement***: Funding will be required for location/feasibility study, equipment, and maintenance of the project. Fort Bend County or a municipality may take on some cost and responsibility, but additional funds will be needed.

Implementation Activity 5.7: Promote Domestic Oil Recycling Programs

DO

Use the City of Sugar Land's domestic waste oil recycling program and similar efforts as a model to promote oil recycling (waste domestic oil).

*****Implementation Schedule***: Whether the City of Sugar Land's program is used or a new program is developed, a model program will be completed by 2017. At least one entity, in addition to the City of Sugar Land, should implement the oil recycling program by 2022.

[30] The conversion of most of the utilities in the watershed area may complicate the addition of aeration, and may require additional study. While no applicable study could be found, anecdotal accounts from operators indicate that some aeration technologies in source water waterways can have beneficial impact on DO levels, but also complicate surface water treatment by increasing organic load, changing biological profile, and accenting taste and odor issues. Any solution selected as part of this IA will take into account this waterway's public drinking water use.

*__*Funding Requirement*__: H-GAC staff and/or other stakeholders will be able to work with the City of Sugar Land to develop the model program. The entity(ies) interested in implementing the program will be responsible for funding.

Implementation Activity 5.8: Hold Household Hazardous Waste (HHW) Collection Event

DO

Work with Phase II communities, County, and municipalities to hold one or more yearly HHW collection events. HHW can contain substances that create oxygen demand in water.

*__*Implementation Schedule*__: At least one HHW collection event should be held in the next five years (2017). There are several entities that can hold such events, so it may be possible to schedule events on a recurring basis.

*__*Funding Requirement*__: Additional funding may be needed to coordinate and hold these events. Disposal fees and/or equipment costs may apply, but the responsible entity may be able to take on some cost of the event.

Implementation Strategy 6.0: Urban MS4 Stormwater Management

Since the completion of the TMDL projects, many local MS4s have become subject to Phase II stormwater permits. Required permit activities are expected to reduce bacterial inputs and improve DO levels by addressing pollutants in urban stormwater outfalls.

Implementation Activity 6.1: Continue MS4 Phase II Activities

Bacteria/DO

Several entities in the watershed have existing Phase II permits, and census revisions will incorporate most other areas in the watershed. Entities with permits will continue these activities, and entities without permits will be encouraged to adopt these practices.

- Illicit Discharge Detection and Elimination – continue to utilize existing resources, and develop model standard operating procedures (SOP) for eliminating illicit discharges. Review existing ordinances, etc. to see if changes would be of benefit. Fort Bend County will continue and consider expanding their dry weather sampling program.
- System Mapping – MS4s will be encouraged to map their systems to aid in discharge detection and system management.
- Mark Storm Drains – Promote marking storm drains with “drains to waterway” or similar slogans to deter illicit dumping.

- Stormwater Education – Continue stormwater pollution prevention education in coordination with education strategies outlined in ISs 3.0 and 4.0. Consider including specific bacteria reduction components.

****Implementation Schedule***: This activity is an ongoing process throughout the implementation phase of the plan. The MS4 communities have implemented productive programs since the initial TMDL was adopted, which may have already had some positive impact on water quality. It is important to continue the support of these programs.

****Funding Requirement***: Because these activities are already in place, no additional funding is necessary. H-GAC project staff will provide support to the communities as necessary.

Implementation Activity 6.2: Develop Model Ordinances for Pet Waste and Waste Haulers

Bacteria/DO

Some entities (e.g. the City of Sugar Land) have developed pet-waste and waste-hauler[31] ordinances that address stormwater concerns. Develop model ordinances based on these examples and encourage other entities in the watershed to adopt them.

- *Fort Bend County Waste Hauler Ordinance* – Support the development of a County-wide waste hauler ordinance by Fort Bend County.

****Implementation Schedule***: The two entities (City of Sugar Land and Fort Bend County) already have ordinances in place. For these entities, H-GAC project staff will focus on providing technical assistance, document review, and related support as requested. Model ordinances based on these and other ordinances will be created by H-GAC project staff, and approved by the project stakeholders, in 2013.

****Funding Requirement***: Since ordinances have already been developed, staff and other stakeholders are able to provide assistance as needed. No further funding will be required.

Implementation Activity 6.3: Enforce Existing Requirements

Bacteria/DO

Work with local Phase II permittees, municipalities, and other enforcing entities to identify ways to increase enforcement of existing requirements, provide model

[31] An example of this type of ordinance can be found at <www.sugarlandtx.gov/public_works/solid_waste_recycling/solid_waste/commercial.asp>.

ordinances and programmatic materials, and seek additional grants or other funding to fill gaps as needed.

****Implementation Schedule***: Assisting the Phase II communities and other organizations with efforts to fund or otherwise facilitate increased enforcement will be an ongoing task throughout the implementation process. There is no timeline because enforcement policies will vary by entity and will change over time.

****Funding Requirement***: H-GAC staff will be available to assist entities with this activity, but funding may be required to carry out the implementation of increasing enforcement.

Agriculture, Invasive Species, and Wildlife

While agricultural activity in the watershed is decreasing, sufficient activity exists to provide bacterial loading based on BST work in the bacteria TMDL (See Table D.1). Additionally, waste, decaying organic matter, and fertilizer use in agricultural activity can be a source of oxygen demand. Invasive species and wildlife strategies focus on feral hogs, with the benefit of reducing producer losses, and avian populations that directly deposit fecal matter in the water.

Implementation Strategy 7.0: Agricultural/Livestock Management

Row crop and livestock practices, regardless of the size of the operation, can impact bacteria concentrations and DO levels. These activities seek to utilize and expand existing programs that have proven to be effective and well received by the agricultural community.

Implementation Activity 7.1: Continue TDCJ Farm Property Practices and Swine CAFO

Bacteria

The TDCJ owns and operates agricultural property within the watershed, along with a swine CAFO. TDCJ will continue to monitor any discharges and conduct routine sampling as required under their permit and pollution prevention program. Recommend TDCJ evaluate the operations and design of these properties for any potential to reduce bacterial loading. Provide support for any request from the TDCJ for additional state or federal funding to address any identified concerns.

****Implementation Schedule***: This IA only recommends continuing current action and providing support as needed. As such, there is no new action to be taken that requires a schedule. Sampling and monitoring should be conducted throughout the implementation phase of the project.

*__*Funding Requirement*__: TDCJ is responsible for all monitoring of the swine CAFO. H-GAC project staff will provide any requested support, but no additional funding is required for this activity.

Implementation Activity 7.2: Promote and Implement Water Quality Management Plans and Agricultural Financial Incentive Programs

Bacteria/DO

Promote existing financial incentive and land management projects through organizations including Texas AgriLife Extension, the Soil and Water Conservation Districts/TSSWCB, and the United States Department of Agriculture Natural Resource Conservation Service (USDA NRCS; through the Environmental Quality Incentives Program [EQIP] and similar incentive programs) to implement management measures (such as cattle fencing, alternate water supplies, nutrient management, etc.) on large agricultural properties. Based on previous success in other watersheds, the initial focus among these programs will be Water Quality Management Plans (WQMPs).

Several essential practices from the NRCS Field Office Technical Guide (FOTG) included in a WQMP (See Appendix C) are of specific applicability to the bacteria, CBOD, and NH_3-N reduction goals of these TMDLs and this I-Plan. A grazing management system is a vital component of a WQMP for livestock operations. Nutrient management, conservation tillage, crop residue management, and buffers are critical components of a WQMP for cropland operations. According to TSSWCB records, there are no certified WQMPs in the Upper Oyster Creek watershed (as of April 18, 2012).

BMPs 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, alternative 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.

BMPs for Cropland Operations: Conservation tillage is a method of soil cultivation that leaves the previous year's crop residue on fields before and after planting the next crop, to reduce soil erosion by water and/or wind. Additionally, conservation tillage improves soil quality and water infiltration and reduces evaporation at the soil surface. Crop residue management may also include the use of cover crops after low residue producing crops. Nutrient Management ex-

amines the amount (application rate), source, placement (method of application), and timing of the application of nutrients (e.g., commercial fertilizers, manure, soil amendments, and organic by-products) to ensure adequate soil fertility and favorable crop yields while minimizing the potential for environmental degradation, particularly surface water runoff and groundwater contamination. Buffers are small areas or strips of land in permanent vegetation, designed to slow water runoff, stabilize riparian areas, and improve wildlife habitat. Strategically placed, buffers can effectively mitigate the movement of sediment, nutrients, and pesticides within cropland. Buffers include: contour buffer strips, field borders, grassed waterways, filter strips, windbreaks, riparian herbaceous cover, riparian forest buffers, and wetlands.

*****Implementation Schedule***: At least one of these financial incentive programs should be installed somewhere in the watershed in the next five years (2017). Most of the agricultural activity is in the northern portion of the watershed, so it will be necessary to work with those landowners in the coming years to decide on the best application of these programs. If found to be successful, and if there is a demand for these programs, it may be possible for a more widespread application of these activities. The TSSWCB, in collaboration with the Coastal Plains Soil and Water Conservation District (SWCD) #317 and the NRCS, will continue to provide technical assistance to landowners in developing and implementing WQMPs. TSSWCB will develop WQMPs on 100% of livestock and cropland operations in the Upper Oyster Creek watershed who request planning assistance through the SWCD. TSSWCB will annually perform status reviews on at least 50% of all WQMPs in the Upper Oyster Creek watershed.

*****Funding Requirement***: Financial Incentives to Implement BMPs. Since the beginning of the TSSWCB WQMP Program in 1995, financial incentive funds (state general revenue) have been allocated to SWCDs in priority areas across the state and obligated by the SWCDs to individual producers. Historically, the Coastal Plains SWCD #317 has been included in one of these priority areas and has received an allocation of financial incentive funds. In FY2012, $17,000 in state appropriations was allocated by the TSSWCB to the Coastal Plains SWCD #317. This SWCD is more extensive than just the Upper Oyster Creek watershed and landowners from any portion of the SWCD may apply for these funds. Livestock and cropland producers in the Upper Oyster Creek watershed seeking financial incentives from TSSWCB to implement specific BMPs prescribed in a WQMP may request funding through the Coastal Plains SWCD #317. The TSSWCB expects to continue this level of financial incentive funding into the foreseeable future, depending on appropriations from the Texas Legislature. Federal Farm Bill programs implemented through NRCS provide additional financial incentives for producers to implement specific BMPs prescribed in a WQMP. TSSWCB and NRCS will continue to provide appropriate levels of financial incentives to agricultural producers that will facilitate the implementation of BMPs

and WQMPs in the Upper Oyster Creek watershed. It is not anticipated that any new sources of funding will be required to implement this management measure. The availability of other financial incentive programs will be dependent on allocations in the upcoming Farm Bill, and opportunities will likewise be dependent on those allocations.

Implementation Strategy 8.0: Feral Hog Management

Feral hogs represent a growing impact on agricultural production and water quality in Fort Bend County. In addition to sizeable production losses, unchecked feral hog populations produce significant bacteria loads.

Implementation Activity 8.1: Promote Technical Assistance and Direct Operational Assistance to Landowners for Feral Hog Control

Bacteria/DO

Feral hogs, an invasive species, have been identified as significant contributors of pollutants to water resources. As feral hogs congregate around water sources to drink and wallow, this concentration of high numbers of feral hogs in 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, soil loss, and habitat destruction.

Efforts to control feral hogs should be undertaken in the Upper Oyster Creek watershed to reduce the population, limit the spread of these animals, and minimize their effects on water quality and the surrounding environment.

Texas Wildlife Services (See Appendix C) provides technical assistance and direct operational control services to landowners for the control of feral hogs. Direct operational control services may include trapping, hunting, and helicopter-based aerial control. Direct operational control services are limited to availability of Texas Wildlife Services personnel in cooperative association areas across the state, but technical assistance can be provided to individuals on how to resolve feral hog problems.

Based on successful efforts to provide integrated educational programming and technical assistance to landowners in another watershed on feral hog management, and in coordination with the delivery of LSHS Feral Hog (see IA 3.1), AgriLife Extension will provide technical assistance on feral hog management to landowners in the greater Houston area, including the Upper Oyster Creek watershed. AgriLife Extension will also track feral hog management activities conducted by cooperating landowners in priority watersheds. This will be accomplished utilizing CWA Section 319(h) grants from TSSWCB and USEPA.

*__*Implementation Schedule*__: IA8.1 is different than the educational aspect (IA 3.1) of feral hog management in that this activity is intended to provide technical assistance to individual landowners and direct operational assistance for feral hog control. Technical assistance will be provided to 100% of landowners in the watershed who request assistance from AgriLife Extension or Texas Wildlife Services in the next five years (2017), depending on the Funding Requirement (below). Direct operational control services may be provided to landowners by Texas Wildlife Services, depending on the Funding Requirement (below).

*__*Funding Requirement*__: The provision of technical assistance by AgriLife Extension to individual landowners for FY2013-2014 is currently being considered for funding by EPA. TSSWCB and AgriLife Extension anticipate that additional grant funding will be necessary to continue providing technical assistance in future years to landowners in the Upper Oyster Creek watershed. Cooperative funding will be necessary for Texas Wildlife Services to provide direct operational control services in the Upper Oyster Creek watershed. Additionally, landowners will incur costs for direct control of feral hogs they conduct; these costs could be mitigated by financial incentives provided by state or federal agencies.

Implementation Activity 8.2: Suggest Fort Bend County Consider Support of Feral Hog Eradication Program

Bacteria

Request that the County review its ability to support or engage in a feral hog eradication program, or coordinate with other technical experts like AgriLife Extension's Texas Wildlife Services Program, and review available funding from state and federal sources to support additional eradication efforts.

*__*Implementation Schedule*__: The stakeholders will make a proposal to Fort Bend County by 2014 outlining recommendations for feral hog management efforts. Assuming Fort Bend County does decide to investigate the possibility of such a program, it would be recommended that the program be implemented as soon as it is feasible.

*__*Funding Requirement*__: The feasibility of an eradication program will be directly affected by available funding. The county may be willing to take on some portion of the cost of the program, but additional funding will need to be obtained.

Implementation Strategy 9.0: Avian Wildlife Management

Introduced or domestic avian species can produce concentrated loadings in amenity lakes and other water bodies affecting the segment. Additional wild avian species in colonial nests above the water can impact bacterial concentrations downstream.

Implementation Activity 9.1: Investigate Avian Wildlife Management Options

Bacteria

Evaluate further IAs and specific methods based on the results of IA 2.2: Assess Avian and Bat Populations.

****Implementation Schedule***: Once the assessment of bird and bat populations is completed, stakeholders should move forward with evaluating management options for the multiple species of birds and bats in the watershed. This will be an ongoing activity throughout the implementation phase of the project, but the initial report on options will be completed by 2015. Stakeholders will coordinate with United States Fish and Wildlife Service, Texas Parks and Wildlife Department, and other expert organizations to ensure compliance with all applicable standards, and to receive feedback and suggestions for most effective options. H-GAC project staff will disseminate the report upon completion, and seek feedback from the stakeholders on its contents within 6 months of its conclusion. The initial investigations under this activity will be completed prior to implementing IAs 9.2, 9.3 and 9.4. Based on TxDOT's current internal policy, the assessments and subsequent implementation practices will not include TxDOT infrastructure unless specifically requested by TxDOT.

****Funding Requirement***: There will be no additional funds required for evaluating management options in this activity. H-GAC project staff and stakeholder time will be sufficient for completing this task.

Implementation Activity 9.2: Implement Pigeon Exclusion Practices

Bacteria

Suggest municipalities/districts consider discouraging pigeon roosting near bridges and areas adjacent to the water bodies of Upper Oyster Creek. Potentially pursue opportunity for shared contract to reduce costs. The method/extent will be determined by findings of IA 2.2: Assess Avian and Bat Populations. Based on a TxDOT study regarding the effectiveness of avian exclusion devices on deterring pigeons, TxDOT infrastructure will not be considered for implementation sites.

****Implementation Schedule***: In the next five years (2017), at least one location will have pigeon exclusion device(s) installed, dependent on the outcome of IA 2.2. It will be necessary to first work with the various entities in the watershed that are responsible for the bridges crossing Upper Oyster Creek in order to determine the proper location. If this activity is successful, it may be desirable to install these exclusion methods in more locations during the implementation phase of the project.

****Funding Requirement***: Additional funds will be required for completing an assessment to determine the location of applicable bridges, for installing the exclusion devices, and for maintaining them. These funds are not currently in place, so they will be needed before this activity can be implemented.

Implementation Activity 9.3: Implement Domestic Duck Removal

Bacteria

Suggest municipalities/districts consider trapping and removal of Muscovy ducks and other domestic duck species, and/or contraceptive practices (e.g., addling of eggs), in areas of the watershed prone to contributing to the bacterial loadings of the water bodies. Pursue potential opportunity for a shared contract to reduce costs among stakeholders and local entities. Determine method/extent by findings from IA 2.2: Assess Avian and Bat Populations and federal guidelines. This IA assumes a periodic management of selected sites, rather that single removal event.

****Implementation Schedule***: In the next five years (2017), at least one location should be selected for periodic removal of domestic ducks. Once the bird population assessment is completed, the duck distribution[32] should provide the most beneficial locations to focus on duck removal. There are amenity ponds throughout the watershed with an abundance of domestic ducks, so if a removal effort is successful, this activity has the potential to be repeated in several locations throughout the implementation phase of the project. This IA will require continual management to retain the benefit.

****Funding Requirement***: Additional funding will be required for this activity. Depending on the chosen removal method(s), the required funding amount will vary. It is possible that the entity(ies) responsible for the ponds will be willing to take on a portion of the removal costs, but it is likely that additional funding will be needed for the project.

Implementation Activity 9.4: Implement Swallow Exclusion Practices

Bacteria

Work with Fort Bend County and other relevant road and bridge-maintaining entities to implement exclusion systems for large swallow colonies located on local or county bridges over the water bodies of the watershed. The focus would be on the implementation of exclusion practices out of season (while the birds are ab-

[32] For the purpose of this document, "duck populations" should be taken to mean populations of domestic ducks (e.g., domestic mallards, and Muscovies, and hybrids), and not transient or resident populations of wild ducks (e.g., black-bellied whistling ducks) that are protected under the Migratory Bird Act with an existing and applicable Control Order in place. While "domestic" Muscovy ducks are considered the same as wild Muscovy ducks for the purpose of the Act, a Control Order allowing land owners to manage their populations exists, relieving watershed municipalities from any requirement to obtain a federal removal permit as long as removal is handled in accordance with all applicable regulation.

sent), not killing. The method/extent to be used would be determined by IA 2.2: Assess Avian and Bat Populations and any applicable federal guidelines. Based on current TxDOT internal policy, swallow exclusion systems will not be implemented on TxDOT infrastructure unless specifically requested by TxDOT.

****Implementation Schedule***: Similar to IA 9.2, at least one location within the watershed should have a swallow exclusion system in place in the next five years (2017). If the activity is successful, swallow exclusion devices may be installed in more locations during the implementation phase of this project.

****Funding Requirement***: Additional funds will be required for completing an assessment to determine the location of applicable bridges, for installing the exclusion devices, and for maintaining them. These funds are not currently in place, so they will be needed before this activity can be implemented.

Human Waste

Human waste or waste byproducts can be introduced into waterways through WWTF overflows, SSOs, illicit connections, or malfunctioning OSSFs. Human waste has a greater pathogenic potential for human health over other sources of bacteria. Additionally, organic material from waste streams creates oxygen demand. These strategies impact management and planning for wastewater infrastructure by building on effective BMPs.

Implementation Strategy 10.0: Wastewater Treatment Facilities

WWTFs[33] have the potential to introduce effluent contaminated with bacteria or compounds contributing to DO impairment. Additionally, alternative practices can reduce discharge volumes and loadings of bacteria and oxygen-demanding substances.

Implementation Activity 10.1: Recommend to WWTFs without Limits to Begin Sampling Now

Bacteria/DO

To better prepare systems to meet future bacteria limits in permits, recommend that WWTFs without bacteria limits consider sampling prior to renewing or amending permits to forestall any surprises.[34] This practice provides additional data for evaluation, and also helps systems test their readiness for future permit limits.

****Implementation Schedule***: The initial phase of this activity will have to include interaction with facility management and operators. TCEQ will require all

[33] For the purpose of this document, WWTFs will refer to the treatment facilities and their outfalls, excluding their respective sanitary sewer collections systems.
[34] This voluntary activity is designed for systems without current bacteria limits. TCEQ will be including bacteria limits for all permits, regardless of this activity.

facility permits to include sampling for bacteria after the next permit renewal. Because permits are renewed on a five-year basis, all permits will require bacteria sampling within five years. In order to meet this IA, at least one facility, prior to its permit renewal, will need to begin sampling by 2014.

****Funding Requirement***: Additional funding will be required for this IA. Undertaking additional sampling will add increased cost to each facility's sampling regimen, which might be seen as an unfunded mandate. However, each facility will have to begin bacteria sampling after its permit is renewed, at which point, this cost will be negated by required sampling.

Implementation Activity 10.2: Increase Compliance and Enforcement by TCEQ

Bacteria/DO

Support efforts by the BIG, etc. to ensure TCEQ has adequate staff and resources to increase compliance and enforcement of failing treatment facilities, etc. To increase support from stakeholders, based on concerns expressed during the I-Plan development process, an outreach focus will be placed on the benefits of enforcement in preserving surface drinking water source quality, and thus reducing treatment costs. Support will come in the form of staff technical assistance, public letters of support, joint proposals or petitions, or other appropriate means of support for efforts undertaken by the BIG. The intent is to publicly lend the formal support of the stakeholder group to public efforts undertaken by the BIG.

****Implementation Schedule***: This activity is an ongoing effort to work with TCEQ and the BIG to increase enforcement capability by TCEQ staff. Other projects have identified the lack of enforcement capabilities as a potential reason for continued water quality problems in the area.

****Funding Requirement***: There is not an additional cost to be incurred by stakeholders in the watershed. Therefore, additional funding may not be necessary. If TCEQ is able to increase enforcement, the cost will be taken on by the TCEQ itself.

Implementation Activity 10.3: Encourage Wastewater Reuse

Bacteria/DO

Suggest that WWTF owner/operators consider and implement wastewater reuse projects for non-potable water needs, in compliance with all applicable standards. H-GAC will assess the cost effectiveness of current proposed or functioning reuse projects in the watershed. Consideration of the impact of reuse on concentrations in the segment will be considered.

*****Implementation Schedule***: This activity will require ongoing interaction between H-GAC project staff, stakeholders, and facility management. However, H-GAC project staff will compile and disseminate program materials on the project website by 2014, and work with at least two facilities to encourage consideration of reuse projects by 2017.

*****Funding Requirements***: In order for reuse projects to be implemented, additional funding will be required for each project. Each project may require a substantial amount of funding, so identifying the possible sources will have to be a task taken on by the stakeholders.

Implementation Activity 10.4: Consider Stricter Bacteria Limits if Data Indicates Necessary

Bacteria

Recommend that potentially lower bacteria limits (i.e. 63 most probable number [MPN]/100mL) for WWTFs be considered by dischargers if monitoring data over the next five years indicates this is necessary to meet reductions. This decision will be made through coordinated discussions between TCEQ, H-GAC or its successor as facilitator, and the regulated utilities in the watershed.[35]

*****Implementation Schedule***: As more facilities sample for bacteria, more data will become available for use in analysis. H-GAC has completed initial analysis of bacteria effluent data, but not enough is available to make any determinations. Through the CRP, Upper Oyster Creek is sampled regularly for bacteria levels. In the next five years, an assessment of water quality will be completed with all available data. Using this assessment, coordinated discussions will take place with the appropriate local decision-makers.

*****Funding Requirement***: Additional funding will be required to complete an assessment. Collecting adequate data and analyzing it may require a contractor to be hired.

Implementation Activity 10.5: Recommend WWTFs Assess Design and Operation Criteria

Bacteria

Suggest that WWTF owners/operators review their design and operation criteria and assess whether they are sufficient to meet limits and maintain compliance. Factors to be considered include utility asset management capability, ability to detect and intercept overflows, ability of existing contact time to meet bacteria limits, etc.

[35] TCEQ will not require stricter limits than the existing WQS. Stricter limits will be available upon request of the permitted facilities.

*__Implementation Schedule__: H-GAC project staff and stakeholders will work with operators to review design and operation as needed. Interaction with facility operators will be a continual process throughout the implementation phase. Within the next five years (2017), at least ten facility assessments should be conducted, as is feasible.

*__Funding Requirement__: Depending on the scale of assessment and improvement needed, the level of funding for this activity will vary. H-GAC project staff will work with facility management to locate potential funding sources.

Implementation Activity 10.6: Recommend Polishing Pond Standards

DO

Work with TCEQ and local developers, municipalities, and related stakeholders, to recommend and/or develop polishing pond standards for existing or new WWTF permits. Dischargers in the watershed have expressed a desire for certainty in design criteria and operation standards. Address how standards impact permit requirements and impairments.

*__Implementation Schedule__: Staff and stakeholders will interact with developers, municipalities, and other involved entities to develop recommendations for standards and criteria for polishing ponds in the watershed. These recommendations will be further developed with, and recommended to, TCEQ. This communication will be continuous throughout the implementation phase of the plan, but an initial proposal will be developed by 2014.

*__Funding Requirement__: This activity only involves planning and developing recommendations, so no additional funding will be necessary.

Implementation Activity 10.7: Recommend Additional Nutrient Sampling

DO

Recommend voluntary additional nutrient sampling (total nitrogen and total phosphorus) by WWTF operators to generate data and provide preliminary indication of whether plants will meet future potential nutrient criteria. Work with TCEQ to encourage and facilitate these efforts. Recommend to plants that find they have greater than expected nutrient levels in relation to their plant size and design that they take necessary steps to reduce nutrient loading prior to limits being instituted, or to comply with limits when they are in place.

*__Implement Schedule__: This activity recommends only voluntary nutrient sampling, so it is reasonable to expect at least one facility to test for nutrients in the next five years (2017). If more operators become willing to sample, then the

number of facilities may be increased over the implementation phase of the project.

*****Funding Requirement***: There is no current funding in place for facilities to test for nutrients, so funds must be allocated for the sampling to occur. The facilities themselves are likely to have to incur the costs for nutrient sampling.

Implementation Activity 10.8: Incorporate BMP Monitoring from Development

DO

Work with TCEQ to devise a means to allow developers to share private (voluntary) sampling information (polishing ponds, BMPs, etc.) without fear of potential impact to permits, etc. Coordinate with efforts under other projects to develop and implement "umbrella"/shared QAPP document solutions.

*****Implementation Schedule***: H-GAC project staff, working in concert with developers and other interested stakeholders, will develop a proposal for the TCEQ by 2014. The intent of this activity is not to impose regulations on developers in the watershed. The goal is merely to incorporate sampling data collected by the developers for the installed BMPs into other databases. A collaborative BMP database is currently being developed in the area, and this data would be a beneficial addition.

*****Funding Requirement***: No additional funding will be required for this activity. The sampling would presumably already be taking place, so the data would only have to be transferred to H-GAC staff. H-GAC is currently creating a regional QAPP, so minimal effort would be involved with including the developers into the QAPP.

Implementation Strategy 11.0: Sanitary Sewer Collection Systems

Aging infrastructure can introduce pollutants into water bodies. Effective management and rehabilitation policies can reduce leaks and overflows.

Implementation Activity 11.1: Strengthen Controls on Subscriber Systems

Bacteria

Work to identify subscriber systems (i.e. areas whose wastewater needs are being met via contract with another community or permit-holding entity). This I-Plan group will support the BIG's efforts to petition the TCEQ for rulemaking to require registration of subscriber systems. The end goal of this effort is to be able to locate, identify, and work with subscriber systems in the watershed, along with regulated entities.

*__Implementation Schedule__: There is currently no database or registry of subscriber systems in the region. The BIG is working to identify these systems in order to obtain a better idea of who is discharging in the waterways. There is no timetable for this activity other than to support the BIG as necessary.

*__Funding Requirement__: Funding may be necessary for this activity if the subscribers are required to register with the TCEQ or other agency. Currently, only staff time will be required for implementing this activity.

Implementation Activity 11.2: Penalties for SSOs

Bacteria

Support efforts by the BIG to work with TCEQ on penalties to provide incentive to address SSOs. The TCEQ recently revised its Penalty Policy #3 to address concerns raised during its most recent Sunset review. The legislature added Texas Water Code Section 7.067 to allow the TCEQ discretion to approve a Supplemental Environmental Project (SEP) that would assist local governments that are respondents in enforcement actions to come into compliance with environmental laws or to remediate the harm caused by those violations. The Statute requires the TCEQ to review the penalty policy regularly. Stakeholders will support the BIG in discussion with TCEQ regarding their review, specifically as it relates to SSOs.

*__Implementation Schedule__: Stakeholders will assist the BIG as necessary to support the TCEQ review of SSO penalty structures.

*__Funding Requirement__: There is no additional funding needed for this activity. H-GAC project staff hours will be available to assist the BIG and TCEQ if necessary. If penalties are increased on facilities, cost will be increased. These costs would be borne by the penalized entities.

Implementation Activity 11.3: Evaluate Fats, Oils, and Grease Requirements

Bacteria

Recommend that collection system owners evaluate their regulations regarding fats, oils, and grease (FOG). Support BIG efforts to develop and disseminate a model program. Recommend that systems enhance their efforts if their evaluation supports a need for additional preventative effort.

*__Implementation Schedule__: In the next five years (2017) H-GAC project staff will work with at least three utilities, including the City of Sugar Land, in the watershed to evaluate their FOG regulations. Stakeholders and staff will assist the BIG to develop a model for the utilities if it is needed.

*__Funding Requirement__: Additional funding may be needed to assist utilities with the development of any new regulations. Enforcement of the regulations may be necessary if a utility does decide to further restrict dumping of FOG.

Implementation Activity 11.4: Develop Utility Asset Management Program

Bacteria

Recommend that individual dischargers develop and implement (or continue) a utility asset management program (UAMP). Suggested elements include regular maintenance, SSO prevention, backup power and maintenance plans for lift stations, enhanced evaluation of subscriber systems, etc. Support efforts by the BIG to develop model program(s).

*__Implementation Schedule__: By 2014, model materials will be developed and made available on the project website. In the next five years (2017), at least one utility will either develop a new UAMP or utilize a program developed by the BIG. Staff will assist the BIG as necessary to develop a model program.

*__Funding Requirement__: Funding may be necessary to assist the utilities with the resources to develop and implement a UAMP.

Implementation Activity 11.5: Encourage Appropriate Mechanisms to Maintain Lift Station Function

Bacteria

Recommend to any system that does not currently have adequate backup power or other means of continued lift station service in emergency situations, that they consider and implement such capacity. Backup power or pumping capacity can alleviate overflows in emergency conditions.

*__Implementation Schedule__: Hurricane Ike, among other emergency situations, raised awareness of the potential adverse environmental effects in the watershed when power is lost for an extended period of time. Backup power capacity for the lift station allows continual operation until electricity is resumed. At least one utility should improve lift station backup capacity in the next five years (2017) in order to minimize the potential for overflows.

*__Funding Requirement__: The utilities that decide to improve their lift station backup capacity will need additional funding.

Implementation Activity 11.6: Support the Development of Streamlined SSO Reporting Database

Bacteria

Support efforts to increase the likelihood of timely SSO reporting.

- Support the TCEQ and the BIG in their efforts to develop a streamlined SSO reporting mechanism, and encourage that it be designed to give access for operators and the public.
- Recommend that Fort Bend County develop a hotline for SSOs that would route calls to the appropriate agency. Develop a list of entities to support this based on existing Fort Bend County Office of Emergency Management information.

****Implementation Schedule***: In coordination with the BIG, a database should be in place for operators and the public to report SSOs in the next two years (2014). This timeline will allow widespread use of the database throughout the watershed during this project period.

****Funding Requirement***: Additional funding may be necessary if/when operators adopt the reporting database. Staff will be available to assist with developing the database, but funding may be required when the database is put in place.

Implementation Strategy 12.0: Onsite Sewage Facilities (OSSFs)

Aging or failing OSSFs (septic systems, aerobic systems, etc.) can be appreciable sources of bacteria, and are not subject to central control like a WWTF or collection system. Identifying and prioritizing the impact of OSSFs in the watershed, while actively working to remediate, replace, or remove failing and at-risk systems can help reduce potential future contamination.

Implementation Activity 12.1: Identify and Address Failing OSSFs

Bacteria/DO

Authorized agents will continue to locate, regulate, and enforce failing OSSF systems. They will attend a yearly meeting to share data and strategies. OSSFs nearest to the waterways will be prioritized. If necessary and feasible, failing OSSFs may be removed and the homes would be connected to sanitary sewer systems.

****Implementation Schedule***: Either a region-wide or watershed-wide meeting will be held annually for authorized agents. In addition, in the next five years (2017) at least 75 malfunctioning OSSFs will be addressed. Over the next 25 years, at least 15 systems will be remediated each year for a total of 375 systems. The OSSFs may need either to be completely replaced or repaired, and remediation will occur as a mix of private maintenance, opportunistic use of funding sources (e.g. SEP), and governmental effort.

****Funding Requirement***: Additional funding will be required to address the malfunctioning OSSFs. The extent of failure and number of OSSFs addressed will determine the amount of funding that will be required to implement this activity.

SEP funds, private homeowner routine maintenance costs, and targeted funding from governmental entities is expected to represent the mix of sources that will be applied to this effort.

Implementation Activity 12.2: Address Inadequate Maintenance of OSSFs

Bacteria/DO

Authorized agents will review regulations and policies to determine if any changes will help reduce failing systems.

****Implementation Schedule***: Current regulations require homeowners to maintain their OSSFs on a regular basis. Despite this, OSSF failures are commonplace throughout the watershed. In the near future, stakeholders and authorized agents will address the inadequate maintenance and determine the most appropriate action. At least one authorized agent will conduct a review, with H-GAC project staff assistance if appropriate, by 2017. At least one other will conduct a review by 2022. Stakeholders will encourage all authorized agents and responsible parties to conduct a review if possible during this time frame.

****Funding Requirement***: Funding will likely be required for whatever action is determined to be the most appropriate to address this problem. Whether it is decided to enact stricter regulation on homeowners or to increase enforcement, authorized agents will need a source of funding.

Implementation Activity 12.3: Continue to Submit/Compile OSSF Data

Bacteria/DO

Support the completion and expansion of the current H-GAC OSSF geographic information system (GIS) project to include violation data and legacy system locations. Authorized Agents will continue to submit current data to support this effort.

****Implementation Schedule***: As part of H-GAC's OSSF GIS project, authorized agents have been asked to submit data to H-GAC. Fort Bend County already has access to global positioning system (GPS) units and collects that data of interest. By 2014 and preferably starting this year, authorized agents will submit OSSF data to H-GAC on at least an annual basis.

****Funding Requirement***: There will potentially be a need for funding for this activity. Increased site visits, among other activities, may be required in order to more adequately compile OSSF data throughout the watershed.

Implementation Activity 12.4:
Utilize SEP Program Funds for OSSF Remediation

Bacteria/DO

Utilize SEP funds to remediate failed OSSFs in the watershed.

****Implementation Schedule***: In the next two years (by the end of 2014), an application for resident OSSF remediation will be developed, and H-GAC will facilitate submission of applications for funding under an existing SEP. This program will aid stakeholders with the repair and replacement of failing OSSFs called for in IA 12.1. Existing outlets include SEP funds provided through the Sam Houston Resources Conservation and Development Area.

****Funding Requirement***: No additional funds are needed for the development and submittal of remediation projects to the SEP program. H-GAC staff time is available to assist with program facilitation.

Implementation Activity 12.5:
Consider Permit Renewal Fee/Permit Transfer Fee

Bacteria/DO

Authorized agents will consider revising their OSSF permit process to add a fee for permit renewal, require permit renewal, or add a fee for transferring a permit. The intended purpose of this fee would be to support current and proposed inspection and remediation efforts.

****Implementation Schedule***: Beginning after five years (2017), authorized agents may decide to address the requirement of a permit renewal and fees for homeowners with OSSFs. Fees will not only provide funding to address failing OSSFs, but renewals will provide the authorized agents with better information about the inventory of OSSFs throughout the county.

****Funding Requirement***: It is unlikely that additional funding will be necessary to implement this activity. H-GAC staff will be available to assist with fee structure and renewal policy development.

Potential Funding Sources

While many of the activities described under this I-Plan require no additional funding, or minimal additional funding, full implementation will require some additional funding, particularly for structural measures. The following is a brief list of potential funding sources. Implementation under this I-Plan may make use of a mix of these sources, or other sources as available. It is the intent of this I-Plan to be compatible with the widest array of potential grant program requirements possible, to provide greater flexibility for its stakeholders.

This I-Plan assumes that a mix of funding will be necessary to fulfill intended implementation measures. The following are a few potential sources for consideration by watershed stakeholders:

Federal Grants – Federal money, administered through grants from the TCEQ and TSSWCB, is available under several grant programs, including Section 319(h),[36] Section 604(b),[37] and Section 106.[38] These grants are competitive, and often require matching funds or in-kind value. The USDA has several programs to provide funds for implementation of agricultural BMPs through the Farm Bill. Most notable is the EQIP program.

State grant/loan programs – Aside from federal monies administered by the state, some state programs exist to fund water and wastewater infrastructure, like the Texas Water Development Board's (TWDB) Clean Water State Revolving Fund and Drinking Water State Revolving Fund, and related programs specific to certain circumstances like the Economically Disadvantaged Area Program. The TSSWCB provides funding for the implementation of agricultural BMPs through its Water Quality Management Plan Program.

Municipal funding – Some elements, particularly those specific to the operation of the wastewater and stormwater systems of counties, cities, and other districts, may need to seek additional funding through sale of bonds or other traditional municipal finance mechanisms.

Private funding – Some activities identified under this I-Plan are likely to benefit from public-private partnerships between local governmental entities and private interests like developers. In some instances, developers may choose to implement certain aspects of this program for their related aesthetic or other benefits. In either case, private funding (potentially recouped through municipal utility districts or other funding mechanism for master-planned communities and similar developments) will likely play a part in the overall mix of funds.

Volunteer/in-kind – Many of the activities identified will rely on the participation of the general public, and many others can be met through volunteer efforts. Community groups like Keep Sugar Land Beautiful have already demonstrated appreciable volunteer capacity and effectiveness in the watershed. It is likely that this source will continue to play a large role in implementation.

[36] This funding source, available in grants from the EPA, as administered through the TCEQ and TSSWCB, funds nonpoint source reduction efforts needed to implement, Watershed Protection Plans and TMDLs.
[37] TCEQ only. This funding source is related to water quality management planning and the State Water Quality Management Plan.
[38] TCEQ only. Section 106 covers water pollution control grants that are used for a variety of research, monitoring, and related activities.

Implementation Schedule

The table in Appendix E provides a summary timeline of the ISs and their corresponding IAs. Milestones are listed for each activity that can be expected to be achieved over the next 2-10 years (through 2022). These milestones provide a baseline implementation schedule. While it is not expected that all activities will be implemented during this timeframe, these milestones provide a useful list of expectations and checklist for future planning. It was also important to note current and potential funding requirements for these activities. When planning future implementation, knowing which activities have, or may require, additional funding can be a useful resource to determine the feasibility for each.

This implementation schedule was based on current known conditions and estimates of funding availability. The timeframes chosen are a phased approach to implementation that reflects stakeholder preference and the changing nature of the watershed. To allow for the evaluation of trends in the waterway as a result of the upcoming conversion to surface water by many of the entities along Upper Oyster Creek, and corresponding changes to flow in the creek from GCWA pumping activities, some more cost-intensive activities are scheduled to occur after the initial 5-year monitoring is complete. In doing so, the impact of more cost-neutral activities can be evaluated prior to full funding commitment. If education, voluntary efforts, and other IAs, in conjunction with related stormwater programs, etc., are able to continue to decrease impairments in the creek, additional structural activities may not be necessary.

While the stakeholders are committed to the mission and activities of this I-Plan, ability to implement items on the scheduled timeframe will be dependent on the ability to secure additional grant funding for some items, and retain current funding for other projects. Regardless, the stakeholders are committed to the goal of the I-Plan, and the use of adaptive management to overcome implementation impediments.

Regardless, this I-Plan is intended to accent an opportunistic approach in its scheduling and activity implementation. If conditions are right to implement an activity prior to the proposed schedule (e.g. if a developer expresses interest in large scale water conservation or runoff mitigation projects in the early years), then the I-Plan group recommends that stakeholders pursue these activities at that time. This is especially relevant to those activities impacting or related to new development.

The matrix table (Table E.1) in Appendix E sums up the implementation schedule and milestones for each activity.

Legal Authority

Under the Texas Water Code, the TCEQ has primary responsibility for managing the quality of surface waters within the state of Texas. These responsibilities include establishing the quality standards for waters of the state, the preparation of the state's management plan for water quality, and the implementation of its regulatory program to control discharges of pollutants to surface waters.

Texas statutory provisions require the Commission to establish the level of quality to be maintained in, and to control the quality of, water in the state (Texas Water Code (TWC) Section 26.011). Texas fulfills its obligations under Section 303(d) of the Clean Water Act to list impaired segments and create TMDLs through functions assigned by the legislature to TCEQ. The 303(d) list is prepared by TCEQ as part of its monitoring, planning, and assessment duties (TWC Section 26.0135).

TMDLs are part of the state water quality management plans that TCEQ is charged by statute to prepare (TWC Section 26.036). As the state environmental regulatory body, the commission has primary responsibility for implementation of water quality management functions within the state (TWC Section26.0136 and Section 26.127). The executive director of the TCEQ must prepare and develop, and the commission must approve, a comprehensive plan for control of water quality in the state (TWC Section 26.012). The list of impaired segments and resulting TMDLs are tools for water quality planning.

The *Texas Surface Water Quality Standards* are contained in Title 30, Chapter 307 of the Texas Administrative Code (30 TAC Chapter 307). TCEQ procedures for implementing these standards are described in *Implementation of the Texas Natural Resource Conservation Commission Standards via Permitting* (RG-194, January 2003, as revised from time to time).

Development and implementation of specific ISs/IAs (e.g. municipal ordinances, development of code revisions, feral hog management programs) will require the legal authority invested in the appropriate stakeholder, as part and parcel of their rights and duties as afforded to them as a subdivision of the State of Texas, or by means of their select ownership or jurisdiction over land, assets, or processes involved in the IS/IA in question.

No aspect of this I-Plan shall be taken as a mandate on any sovereign political entity except insofar as a current or future regulatory relationship exists under established legal authority.

Sustainability

The TCEQ and stakeholders in TMDL implementation projects periodically assess the results of the planned activities and other sources of information to

evaluate the efficiency of the I-Plan. The intent of these efforts is to ensure funds are being spent in an effective manner, ensure goals are being achieved, and ensure that the efforts are sustainable for the life of the I-Plan. Stakeholders 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 provides assessment of the impact implemented IS/IAs are having on the segment. Set indicators or milestones provide points of review for assessing the efficacy of the I-Plan's approach, and are a primary driver for potential revisions.

Water quality monitoring efforts are described in the "Implementation Strategies" section of this I-Plan. The general approach for these efforts is to accumulate data prior to 2017, in which the first primary assessment of progress will be made. At that point, the I-Plan group and TCEQ will consider whether additional actions or mandatory control actions will be necessary. In the interim, data will be assessed every two years to look for trends that may shape decisions on short-term implementation. The indicators of specific importance to this project are:

- **Indicator bacteria concentrations**
  Geometric means for *E. coli* indicate the ability of the waterway to meet contact recreational use standards.
- **24-Hour Dissolved Oxygen**
  DO levels indicate the ability of the waterway to meet intermediate aquatic life use standards.
- **Nutrients**
  Nutrients (NH_3-N, other Nitrogen and Phosphorus compounds as appropriate, and CBOD) will serve as a secondary indicator to establish

relationships between DO levels and nutrients in the water, with the goals of identifying how observed levels of nutrients may impact DO levels.

- **Flow**
  Flow will be an important indicator of the impact of surface water conversion and through-pumpage by the GCWA and local water utilities. Flow change will be a secondary indicator of impact to concentrations of bacteria and DO.

Implementation Milestones

Implementation tracking provides information that can be used to determine if progress is being made toward meeting the goals of the TMDL. Tracking also allows stakeholders to evaluate actions taken, identify those which may not be working, and make any changes that may be necessary to get the plan back on target. Implementation milestones are measures by which the progress of IAs is tracked. For each IS, there are multiple IAs. Each IA has a set task or tasks to be completed. Implementation milestones are measures by which this I-Plan indicates a task will be completed. The completion milestones of the tasks are used as indicators of the progress of the I-Plan implementation. While other factors may impact water quality indicators, implementation milestones can still be used to show progress and level of effort. This I-Plan has attempted to remain conservative, and its implementation milestones are described in Table E.1 in Appendix E.

Review Strategy

The general method of tracking progress for this I-Plan will be based on observable changes in water quality (water quality indicators) and the ability to meet and implement programmatic elements (programmatic indicators) for IA-specific milestones. These milestones are described for each IA in Table E.1 in Appendix E. The TCEQ and H-GAC, or its successor in the project facilitation role, will review these elements during the term of the project. The planned review period for this I-Plan is 10 years (2012-2022). Due to the changing nature of the watershed, the stakeholders have elected to review water quality trends over the first five years, while implementing voluntary measures. In 2017, progress and water quality will be assessed with the implication that control actions may be considered if adequate progress is not made in reducing indicator bacteria concentrations and increasing DO levels to improve the system's ability to assimilate growth over the next five years (2017-2022).

Communication Strategy

Communication is necessary to ensure stakeholders understand the I-Plan and its progress in restoring water quality conditions. The TCEQ and H-GAC, or its successor in the project facilitation role, will disseminate the information derived from tracking I-Plan activities to interested parties, including watershed stake-

holders, state leadership, government agencies, non-governmental organizations, and individuals.

Responsible parties are committed to providing appropriate information to the TCEQ to update progress assessments. Regionally, the progress of this I-Plan will be reported in the annual reports prepared by the BRA and H-GAC under provisions of the Texas CRP.

H-GAC will utilize existing project communication networks, and those of project participants as appropriate, to disseminate materials. Project stakeholders will be encouraged to use their existing methods of communication (e-mail networks, newsletters, TV stations, press releases, etc.) to publicize the project-related activities to the greatest extent practicable. The project website <www.upperoystercreek.com> will continue to be maintained, and serve as a clearinghouse for all project data and materials.

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Appendix A.
Local Examples of Stormwater Programs

Fort Bend County

The Fort Bend County Storm Water Management Plan (SWMP) contains a list of BMPs that meet the objectives of the six Minimum Control Measures required for a Phase II MS4 permit. The website contains links to stormwater education opportunities and a section for construction activities. More information can be found at <www.ms4web.com/fbcswqc/>

City of Sugar Land

The City of Sugar Land is a Phase II permittee and maintains a regularly updated SWMP. The City has elected to take a comprehensive approach with a strong education and outreach focus. More information about their program can be found at: <www.sugarlandtx.gov/index.aspx?nid=332>.

Appendix B.
MS4 Permits in the Upper Oyster Creek Watershed

Table B.1. MS4 Permits in the Upper Oyster Creek Watershed

Regulated Entity Name	Location	RN Number	ID
City of Stafford MS4	The entire city limits of Stafford that is located within the Houston urbanized area and also located in Harris County	RN105569842	TXR040252
City of Sugar Land MS4	Area within the City of Sugar Land city limits that is located within the Houston urbanized area.	RN105507925	TXR040111
Fort Bend County Drainage District MS4	Area within Fort Bend County that is located within the Houston urbanized area	RN105706519	TXR040383
Fort Bend County MS4	Area within Fort Bend County that is located within the Houston urbanized area	RN105481550	TXR040045
Fort Bend County MUD 118 MS4	The entire Fort Bend County MUD 118 within Fort Bend County in the Houston urbanized area	RN105528392	TXR040153
Fort Bend County MUD 119 MS4	Lies wholly within the City of Houston urbanized area	RN105591275	TXR040367
Fort Bend County MUD 2 MS4	Area within the City of Houston ETJ in east Fort Bend County	RN105606255	TXR040367
Fort Bend County MUD 25 MS4	The regulated area is located in northeastern Fort Bend County within the Houston Sugar Land Baytown Metropolitan Area	RN105573042	TXR040260
Fort Bend County MUD 41 MS4	Area within Fort Bend County MUD 41 that is located within the Houston urbanized area	RN105558704	TXR040224
Pecan Grove MUD MS4	Area within Pecan Grove MUD that is located within the Houston urbanized area	RN105559009	TXR040225

Appendix C.
Implementing Agencies for Agricultural Measures

The governmental agencies listed below will be responsible for implementing management measures aimed at reducing nonpoint source loadings from agricultural operations. Their duties and activities related to this I-Plan are described in the Agricultural and Wildlife ISs/IAs.

Texas State Soil and Water Conservation Board

The Texas State Soil and Water Conservation Board (TSSWCB) is the lead agency in Texas responsible for planning, implementing, and managing programs and practices for preventing and abating agricultural and silvicultural (forestry) nonpoint source pollution (Texas Agriculture Code Section 201.026). In accordance with this responsibility, the TSSWCB administers a certified WQMP Program that provides, through local 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 USDA's NRCS Field Office Technical Guide. The Guide represents 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 assistance and financial incentive programs to assist producers in implementing their WQMPs. The TSSWCB utilizes both state appropriations and federal grants to fund the WQMP Program.

Soil and Water Conservation Districts

An 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 currently 216 individual SWCDs organized in Texas. SWCDs offer agricultural landowners and operators technical assistance through a partnership with the NRCS and the TSSWCB as part of standing agreements. 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. Fort Bend County, and the Upper Oyster Creek Watershed, is wholly encompassed by the Coastal Plains SWCD #317.

USDA 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, pasture land, forestland, and wildlife habitats. The NRCS also integrates ecological and economic considerations in order to address private and public concerns.

The NRCS administers numerous programs authorized by the U.S. Congress in the federal Farm Security and Rural Investment Act of 2002 (Farm Bill) that provide financial assistance for many conservation activities:

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

EQIP was reauthorized in the 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 the EQIP program. 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 Field Office Technical Guide and adapted for local conditions. The local SWCD approves the plan.

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.

- Consumer, homeowner, agricultural producers, horticultural 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 ecosystem resources (rangeland and forestry, etc.) through stewardship education in order to support the biological, sociological, and economic sustainability of those resources.
- AgriLife Extension works to advance the planning and management of natural resource-based recreation opportunities in Texas.
- Through pesticide safety education, licensed and unlicensed pesticide users (including farmers, ranchers, pest control businesses, and the general public) will understand and adopt safer pesticide and non-chemical management methods for managing pests and will be able to continue their pursuit of business enterprises and employment.

- Through cooperative agreements between AgriLife Extension, USDA-Animal and Plant Health Inspection Service (APHIS) Wildlife Services, and the Texas Wildlife Damage Management Association (a private non-profit organization), the Texas Wildlife Services program provides statewide leadership in the science, education, and practice of wildlife and invasive species (feral hogs) management in order to protect the State's agricultural, industrial, and natural resources, as well as the public's health, safety, and property from the negative effects of wildlife (Texas Health and Safety Code Chapter 825). Texas Wildlife Services provides both technical assistance and direct operational control services in wildlife damage management to resolve conflicts between humans and wildlife in both rural and urban areas. Funding for these cooperative wildlife management activities comes from state and federal appropriations and from individuals, rancher associations, counties, or municipalities.

Appendix D.
Load Reduction Value Information

Segment 1245 originates at a pump station at the Brazos River, consists of various creeks and drainage ditches, and is impounded within the City of Sugar Land by three dams. Its complex hydrology, combined with bacteria and oxygen demanding substances from a variety of sources, makes it difficult to accurately, and definitively, estimate load reductions throughout the three AUs.

To the greatest degree practicable, this I-Plan relies on established literature values and reduction estimates from similar TMDL I-Plans, Watershed Protection Plans, and related efforts. The BIG's I-Plan for Houston area TMDLs is a primary source for estimating the bacteria reductions this document, although specific calculations and assumptions differ for many of the sources and reductions discussed. The implementation of all activities for this I-Plan will take place over a phased implementation period. The reductions listed are those expected to be achieved over the life of the category being listed, and may not be evident in the initial 1, 5, or 10 year periods.

Many of the estimated reductions are presumptions based on the broad application of the referenced pollutant studies and behavior predictions found in literature, some of which are not specifically water-related. Also, as this is only a presumed reduction in fecal load, it is still undetermined (outside of additional modeling not within the scope of this I-Plan project) how this estimated reduction in fecal load would translate to reduction in fecal indicators or the level of actual pathogens in the waterway.

Because DO is a system response to a variety of potential sources, and because no source tracking information was available for this project, the discussion regarding DO is qualitative, rather than quantitative. The vast changes in system flow expected over the next 3-5 years, due to pumpage and withdrawal changes, are likely to impact DO levels in ways not easily estimated given current information. The I-Plan group found this approach to be satisfactory because: 1) currently no reductions are required under the two TMDLs for DO, 2) current data indicates that the DO problem is not trending for the worse, and 3) it is expected many of the bacteria IAs will also impact DO favorably.[39]

Bacteria Load Reduction Estimates

The 73% reduction goal to meet the pollutant allocations in the TMDL document is a challenge in this system, as BST indicates as much as 57.6% of the bacteria loading comes from sources outside of direct human control (wildlife) or is unable to be identified (unknown). The bacteria estimates presented are based on the schedule and milestones for the IAs described in this I-Plan, values used in similar efforts, and best professional judgment. The baseline estimates for reductions

[39] This I-Plan does not attempt to produce reduction estimates for tangential or indirect impacts of bacteria IAs on DO levels.

are based on the work in the TMDL and its Technical Support Document, and do not account for the uncertainty introduced by potential flow regime changes. For some specific reductions, additional calculation and assumptions needed to be made. For these instances, the BST percentages completed in the original study were assumed to still be valid, for lack of more current data. As with DO, the inability to completely predict or model potential reductions has prompted a preventative approach that focuses on feasible actions and continued data analysis, with an assumption of a continued adaptive management approach.

Table D.1. Fecal Bacteria Loading Contributions by Source[40]

Bacteria Source	Percent Contribution
Human (OSSF and WWTF)	14.2%
Livestock (not including pigs)	13.2%
Pigs (domestic and feral)	5.7%
Pets	9.4%
Wildlife (mammal)	19.5%
Wildlife (avian)	23.2%
Unknown	14.9%

The following are the bacteria reduction estimates for the IA's recommended by this I-Plan, grouped by category. The reductions represent the expected impact of all IAs identified under each category.

Monitoring and Research

Monitoring and research activities are conducted to support other activities and are not intended to directly achieve load reductions. However, because monitoring results may trigger actions (e.g. shift in normal operations at a WWTF) identified in this I-Plan, some reduction is attributed to this strategy.

Implementation Strategy 1.0: Monitoring

2% reduction in load assigned to human sources – The basis for these load reductions is an application of behavioral change estimates made under the BIG's I-Plan for Houston area TMDLs. The BIG's I-Plan, based partly on a 2008 study,[41] assumed that the impact of monitoring as a feedback mechanism for WWTF operators would assume the same function as a well-placed public educa-

[40] These values are based on Table 3-20 of the BST report in the Technical Support Document for the bacteria TMDL, as accessed at: <www.tceq.texas.gov/assets/public/implementation/water/tmdl/25oystercreek/25-uoc-bact-techdoc.pdf>
[41] (Abroms and Maibach 2008)

tion campaign, expecting a change equivalent to 2-4% of targeted goal. In this case, we have used the conservative end of that range for a 2% reduction.

Implementation Strategy 2.0: Research

No reduction expected – It is not expected that these IAs will generate load reductions outside of those attributed to other IA categories.

Education and Outreach

Implementation Strategy 3.0: Continue and Expand Existing Education and Outreach

2% reduction in overall loading – The study of educational campaigns[42] in 2008 indicated that a 2% reduction toward targeted goals could be achieved by a well-designed educational program. Based on the extent and saturation of existing educational efforts, there is sufficient planned educational content to meet and exceed the study's descriptions of a well-designed educational program.

Implementation Strategy 4.0: Implement New Education and Outreach Efforts

2% reduction in overall loading – Based on the extent of new education proposed, and the types of outreach efforts included, an additional 2% is assumed for this category. The basis of this assumption lies in the addition of dimensions to traditional education efforts (e.g. a benefit concert, workshops, etc.). These elements go farther than traditional approaches, and potentially impact a greater portion of the populace, indicating a greater potential impact on behavior.

Urban Nonpoint Sources

Urban nonpoint sources account for contamination from stormwater discharges and general contamination from urban sources other than wastewater treatment systems. It is expected that some reductions attributable to activities in this category may be tied to those discussed in the "Human Waste" category, based on SSOs, etc. For the purpose of comparison to the BST, it will be assumed that the "Pets" and "Unknown" categories make up the total loading attributable to "Urban Nonpoint" sources, yielding a total of 24.3% of total loading (9.4% + 14.9%). Based on similar estimations conducted under the BIG's I-Plan, a 20% reduction to loading assigned to urban nonpoint sources is assumed to be attributable to the IAs of this strategy. The US Department of Housing and Urban Development suggests a range of reduction values related to urban nonpoint source mitigation efforts, with a conservative average assumed to be 20% reduction in loading from this source[43]. Given that there are several existing TPDES Phase II regulated MS4s actively pursuing stormwater programs, with more areas to come under permit in the next several years, and given that data review indicates a generally

[42] (Abroms and Maibach 2008)
[43] (NAHB Research Center, Inc. 2003)

improving trend in bacteria levels subsequent to the approval of the original TMDL study, we expect this overall reduction value to be conservative and supportable even short of full implementation of all IAs.

Implementation Strategy 5.0: General Nonpoint Source Management

5% reduction in load assigned to urban nonpoint sources – Based on the breakdown of IAs between strategy 5 and 6, it is expected that strategy 5 will account for a quarter of the effort and potential reduction (i.e. 20% of source-based loading, as discussed previously), thus yielding a 5% reduction in source loading.

Implementation Strategy 6.0: Urban MS4 Stormwater Management

15% reduction in load assigned to urban nonpoint sources – As per the discussion in strategy 5 above, it is expected that strategy 6 will account for three quarters of the effort and potential reduction (i.e. 20% of source-based loading, as discussed previously), thus yielding a 15% reduction in source loading. MS4s in the watershed are actively implementing stormwater programs, and additional activities recommended under this I-Plan are designed to augment these efforts.

Agricultural and Wildlife

While there is a wealth of information regarding implemented BMPs targeting wildlife and agriculture, there is an identified need for additional research on the effectiveness of these measures. To account for the reductions estimated for the wide array of IAs recommended by this I-Plan, comparable efforts conducted under other WPPs and I-Plans were used, along with literature sources. For the purpose of comparison to the BST data, agriculture and wildlife is assumed to comprise the livestock, pigs, mammalian wildlife, and avian wildlife source categories.

Implementation Strategy 7.0: Agricultural/Livestock Management

20% reduction in load assigned to livestock – This reduction is based on similar estimates produced by the BIG and through modeling done under the Plum Creek WPP. Specifically, a study referenced in the BIG suggests that the load attributable to each population addressed may result in up to a 65% reduction in loading from that population[44]. Based on the degree of effort in this I-Plan, an estimate of 20% of reduction from sources is used, in comparison to modeled numbers in the Plum Creek Watershed, and lower estimates in the BIG's I-Plan (which does not address livestock to the same extent). The derivation of this estimate is based on best professional judgment of the relative level of effort of the activities contained in this I-Plan as compared to the corresponding efforts in Plum Creek and the BIG. The reduction was selected as a proportional figure based on the comparative level of effort.

[44] (Wagner, et al. 2008)

Implementation Strategy 8.0: Feral Hog Management

10% reduction in load assigned to pigs – This reduction is based on similar estimates produced by the BIG and through modeling done under the Plum Creek WPP. Specifically, a study referenced in the BIG suggests that the load attributable to each population addressed may result in up to a 65% reduction in loading from that population[45]. Based on the degree of effort in this I-Plan, an estimate of 10% of reduction from sources is used, in comparison to modeled numbers in the Plum Creek Watershed. This estimate is based on the comparative approaches, and the concern among the I-Plan group that feral hogs would not be able to be adequately controlled, as compared to reductions attributed to domestic animals. Because the swine CAFO is already operated under permit, continued/enhanced operations are not expected to greatly reduce current loading from that porcine source. The derivation of this estimate is based on best professional judgment of the relative level of effort of the activities contained in this I-Plan as compared to the corresponding efforts in Plum Creek and the BIG. The reduction was selected as a proportional figure based on the comparative level of effort.

Implementation Strategy 9.0: Avian Wildlife Management

20% reduction in load assigned to avian wildlife – Based on discussions with stakeholders, large migratory bird populations (e.g. large snow geese flocks) are not common in the watershed. Most migratory bird presence is transient during fall and spring migration periods. Therefore, the focus of the reductions is on colonial nesters on bridges in the watershed. An informal assessment conducted during this project indicated that the majority of the bridges that crossed Segment 1245 and its tributaries had evidence of swallow colonies. A 2011 study showed that swallows colonies above waterways can have an appreciable impact on bacteria indicator concentrations[46]. In urban areas, resident domestic duck populations are common in the many amenity lakes of the area's residential neighborhoods and commercial centers. In a review of other projects dealing with avian wildlife, only the Guadalupe River Above Canyon Lake TMDL I-Plan[47] for bacteria had references to specific load reductions. These reductions were based on modeling not available under this project. A comparison of intended scope and nature of IAs was completed, and based on this relative evaluation, an assumption of 20% reduction of source loading was chosen to represent efforts taken to reduce domestic ducks and colonial nester loading in Oyster Creek.

Human Waste

Human waste sources make up 14.2% of the total bacterial loading to the system. However, the BST could not indicate where this human waste originated, while

[45] (Wagner, et al. 2008)
[46] (Sejkora, et al. 2011)
[47] Implementation Plan for One Total Maximum Daily Load for Bacteria in Guadalupe River Above Canyon Lake, as referenced at <www.ugra.org/pdfs/IPlanAug2011.pdf>.

IAs are specific to individual categories of sources (OSSFs, WWTFs, collection systems). To calculate potential load reductions, a way to divide this total loading among the three sub-sources was necessary. The following methodology was used.

- The total population of the watershed was divided by total dwelling units, to produce households (based on H-GAC's regional forecasting information for Fort Bend County, rather than a generic person-per-household ratio).
- Total population of the watershed was divided by the people-per-household from # 1 (roughly 3.09) to produce total households for the watershed.
- Based on H-GAC's OSSF location GIS inventory, the number of OSSFs in the watershed was found, and the assumption was made that each OSSF serves one household. Therefore, 1 OSSF = 1 household. H-GAC's OSSF data is based on Ft. Bend County's meticulous database of regulated OSSFs. Based on the age of development in the watershed[48], legacy OSSFs (i.e. unregulated or grandfathered OSSFs) were assumed not to be a large issue for the future, but were estimated by applying a 50% factor to the identified systems. This assumption was based in part on stakeholder input and accumulated data on system age and condition in the watershed, and the comprehensive nature of the Fort Bend County data.
- Any household not served by OSSF was assumed to be served by WWTF. Therefore total households – OSSF households = WWTF households.
- The percentage of total watershed households was then found for both OSSF households and WWTF household, respectively.
- This percentage was equated to their share of the loading; i.e. if 7% of the households are served by OSSFs, OSSFs account for 7% of the human waste loading.
- This methodology is the greatest degree of precision that could be achieved with the existing data. If greater precision is needed for future endeavors, this I-Plan recommends additional modeling to more accurately reflect typical contributions from each source.
- Using the BST results referenced above, the percentages for each portion of the human sources category was calculated. Because of the relatively few OSSFs (approximately 1,662) in the watershed compared to households served by a WWTF:
- 7% of the human source loading is contributed by OSSFs, while;

[48] The majority of the permitted OSSFs were located in developments new enough to have required permitting from inception.

- 93% of the human source loading is contributed by WWTFs and collection systems. (For this purpose, "collection systems" include lift stations, sanitary sewer lines and any other infrastructure other than the treatment plant itself.

The following are the load reductions for strategies related to human waste sources:

Implementation Strategy 10.0: Wastewater Treatment Facilities

10% reduction in load assigned to the WWTF/collection systems portion of human sources – In consideration of the potential impact of the IAs of this strategy, similar projects were compared. The IAs for the BIG's I-Plan are very similar, so similar reductions are estimated. Because the average age of infrastructure for the facilities in the watershed is newer than the infrastructure in the BIG area, the most conservative estimation was used. Therefore, a 10% reduction was estimated. This reduction was applied to the 93% proportional share of the loading from human sources. This estimation may be refined in the coming years as more plants have bacteria testing appended to their permits.

Implementation Strategy 11.0: Sanitary Sewer Collection Systems

20% reduction in load assigned to the WWTF/collection systems portion of human sources – Due to the scope of IAs recommended for this strategy, specific load reductions could not be estimated directly. The general trend in the watershed is toward more progressive management of collection system infrastructure. Because collection systems are more often the source of large bacteria contributions (via failing lift stations, collection system leaks, overflows, etc.) than WWTFs, with permitted discharges, a greater reduction is expected for this strategy.

Implementation Strategy 12.0: Onsite Sewage Facilities (OSSFs)

100% reduction in current load assigned to the OSSF portion of human sources – The reduction of OSSF loading is based on an assumption that 100% of the loading in the watershed is from failing OSSFs. Based on a study[49] estimating OSSF failure rates in Texas, up to 19% of OSSFs may be failing in the watershed. There were 1108 OSSFs identified in H-GAC's data. This does not account for legacy systems that were put in before the permitting requirements, or systems that were not regulated. While these are expected to be minimal in number in this watershed, given the general age of development, a safety factor of 50% (i.e. it was assumed that there were 0.5 legacy systems for every one regulated system) was added. Therefore, the estimate is that there are 1662 OSSFs in the watershed. While 19% is the given average for failure rate in Texas, this number was lowered slightly to account for the newer age of development, and 15% failure rate was chosen. Fifteen percent of the 1662 systems equates to 250 systems. The

[49] (Reed, et al. 2001)

estimated replacement or remediation rate assumed for this project is 15 systems a year, for 25 years. This will result in 375 systems replaced or taken off line. Therefore we expect 100% of current load (250 systems) to be reduced, and a safeguard against loading from future failures to be addressed at least partially by the additional 125 systems. Future load may be influenced by continued development, but this is not predictable at the current time, without knowing whether development will use sanitary sewer or OSSF. Based on trends in the watershed, it is expected that the use of MUDs and sanitary sewer systems will continue, minimizing the use of new OSSFs in the eastern and central portion of the watershed.

The total impact of all bacteria IAs by the end of implementation is expected to be approximately 22%. While this does not result in an initial 73% reduction, it does represent a 65% reduction in those portions of the identified loading sourced that are wholly within direct human control (Pets, Human Waste, and Livestock). However, this assumption is based on bacteria levels and flow conditions present during the initial TMDL study. Informal data review of BRA sampling was conducted to provide a temporary decision-making tool for the stakeholders. This data showed a reduction in bacteria levels from the original levels indicated in the TMDL study. As stated in the implementation discussion, further IAs will be considered after five years of monitoring and initial implementation is conducted. If further reduction is still necessary, stakeholders will employ adaptive management in revisiting the approach then. For further detail on bacteria reduction estimates, please refer to Table D.2.

Load Reductions Related to Dissolved Oxygen Levels

The two TMDLs for DO do not require specific reductions for the two constituents (CBOD and NH_3-N) for which load allocations were developed. However, the TMDL document indicates that levels of the two pollutants are at or near the assimilative capacity for the two reaches. Given that growth continues in the watershed, it is likely some degree of intervention will be necessary in the coming years. However, given the potential for considerable changes in flow type, consistency, and volume in the system due to the surface water conversion process, no valid assumption regarding a linear relationship of growth to increases in pollutant loading could be assumed. As no additional modeling was completed for this project regarding future flow conditions, and no load reductions were required under the TMDL, the reductions discussed below are qualitative in nature.

Table D.2. Bacteria Reduction Estimates

Reduction by Implementation Strategy (converted to percent reduction of total loading)

Bacteria Source	Percent Contribution	IS 1	IS 3	IS 4	IS5/IS6	IS 7	IS 8	IS 9	IS 10	IS 11	IS 12	Total Reduction by Source
Human (OSSF and WWTF)	14.20%	0.28%							1.32%	2.64%	0.99%	5.23%
Livestock (not including pigs)	13.20%					2.64%						2.64%
Pigs (domestic and feral)	5.70%						0.57%					0.57%
Pets	9.40%				1.88%							1.88%
Wildlife (mammal)	19.50%											0.00%
Wildlife (avian)	23.20%							4.64%				4.64%
Unknown	14.90%				2.98%							2.98%
Total Loading	100%		2%	2%								4.00%
Total Reduction	n.a.	0.28%	2.00%	2.00%	4.86%	2.64%	0.57%	4.64%	1.32%	2.64%	0.99%	21.94%

The TMDL concentrated on point sources, but noted that nonpoint sources would likely have to be addressed. This I-Plan focuses on both sources of pollutants, and considers other constituents in addition to the CBOD and NH_3-N load allocations.

One of the foremost potential drivers for DO levels in the Upper Oyster Creek system will be the aforementioned impact of flow regime changes. As the GCWA continues to increase pumpage from the Brazos River into the system, and water users in the system begin to make withdrawals to meet the Subsidence District's 2013 and 2025 reduction deadlines[50], further study will be necessary to understand the "new normal" for flow in the system, and its impact on DO. This I-Plan recommends IAs to evaluate these changes, to be implemented in the beginning years of the process. Because the system is in flux compared to the time under which the TMDL was completed, the ability to accurately predict latter IAs impact on DO levels is in question.

Based on this uncertainty, the I-Plan group took a preventative approach aimed at reducing multiple sources of oxygen-demanding contaminants. The intent is to reduce the current impairment and help lessen the impact of future growth. The I-Plan group felt strongly that reductions to bacteria sources, especially in regard to IAs for WWTFs, collection systems, and OSSFs, are likely to also impact DO through reduction of nutrient input and oxygen demanding materials. Many of the IAs chosen for inclusion were selected for their potential to benefit both conditions.

The informal water quality data review conducted under this project indicated that DO levels are not trending downward[51], even with the impact of continued growth. While this study was merely an informal decision making tool for the stakeholders, its preliminary results indicate that their preventative approach, coupled with a need for further evaluation of flow changes, is valid.

Absent any changes to flow conditions that might negatively impact DO concentrations, it is expected that DO levels will improve under the implementation of this I-Plan, allowing for the assimilation of future growth. The extent of either factor will likely not be able to be predicted until the surface water conversion process is well underway.

[50] The Fort Bend Subsidence District currently requires a conversion to 30% surface water in 2013, and 60% in 2025. The District has indicated that these conversion requirements may change in the future depending on conditions in the regulated area.

[51] It should not be assumed that water quality is improving. While the data indicated no statistically significant degradation was occurring, flow regimes have begun to change appreciably in the watershed. Therefore, as indicated previously, this I-Plan calls for additional, concentrated 24-hour DO sampling to more accurately indicate the trend of DO levels as the flow changes occur and implementation activities commence.

Appendix E.
Implementation Matrix

Table E.1. Implementation Matrix

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Human Waste, all sources (Bacteria)	IA 1.1: Support BIG Regional BMP Database Effort	2% reduction in bacteria load assigned to human sources (0.28% reduction of total load) in total from IAs 1.1-1.4.	No additional assistance needed.	Education for this activity is conducted through the BIG, with support from H-GAC staff.	2012-TBD	H-GAC will develop the BMP database by 2014. Populated database after four years.	Progress is reported in the BIG annual report.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	All
Human Waste, WWTFs, Sanitary Sewer Collection Systems (Bacteria)	IA 1.2: Review DMR/SSO Data over the Next Five Years	2% reduction in bacteria load assigned to human sources (0.28% reduction of total load) in total from IAs 1.1-1.4.	H-GAC staff time and in-house data analysis resources will be utilized for this IA.	H-GAC will disseminate information to stakeholders.	2012-2017	H-GAC will review data every two years.	Progress will be indicated by the successful completion of each two-year data review and report.	DMR and SSO data is self-reported or collected by TCEQ.	All

[52] For more information regarding load reduction estimates, please refer to Appendix D.
[53] A ten year initial implementation phase was used in describing the implementation of these activities. It is expected that the efforts will extend far past this first implementation phase. Therefore, many efforts without specifically noted end dates are expected to carry over to the next implementation phase, or be re-evaluated in 2022.
[54] For these purposes "All" is taken to mean the stakeholder group as facilitated by H-GAC (or a successor to H-GAC's facilitation role), in conjunction with the TCEQ. Similarly, "H-GAC" shall be taken to mean H-GAC or a successor to H-GAC's role as facilitator for this project. The stakeholder group is represented by the responsible parties of the Coordinating Committee and the members of the Work Group.

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
All Sources (Bacteria and DO)	IA 1.3: Continue Ongoing Monitoring Activities	2% reduction in bacteria load assigned to human sources (0.28% reduction of total load) in total from IAs 1.1-1.4.	Monitoring already underway by various entities. Additional NH_3-N and CBOD sampling, if possible, would require additional funding through CRP or supplemental funds.	H-GAC will coordinate with monitors and disseminate information.	2012-2022	H-GAC will review data every two years.	Progress will be indicated by the successful completion of regular monitoring activities.	Ongoing monitoring activities external to this TMDL I-Plan project (e.g., the BRA's CRP monitoring activities) will supply this data.	BRA, TCEQ, MS4 permittees, TDCJ, Texas Stream Team
Human Waste, WWTFs (Bacteria)	IA 1.4: Adopt More Rigorous Bacteria Monitoring Schedule	2% reduction in bacteria load assigned to human sources (0.28% reduction of total load) in total from IAs 1.1-1.4.	No additional assistance needed; coordination/ recommendation activity.	H-GAC will coordinate with TCEQ and WWTFs, and disseminate information.	2012-2017	H-GAC will review water quality data at the 5 year mark to determine if stricter limits are appropriate.	Progress will be indicated by a successful recommendation to WWTFs to adopt more rigorous bacteria monitoring frequencies.	This activity is a part of the monitoring component of this I-Plan. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	H-GAC, TCEQ, WWTFs
All Sources (DO)	IA 1.5: Conduct Additional Monitoring	See Appendix D for discussion of DO load reduction expectations.	Funding for sampling efforts and lab costs will be needed. A QAPP will be required if this monitoring is not conducted under the BRA or CRPs existing QAPP.	H-GAC will coordinate with monitors and disseminate information.	2012-2017	H-GAC or other water quality monitoring entity will conduct at least one study each for the named constituents sampling various locations by 2017.	Progress will be indicated by the number of sampling studies successfully conducted.	This activity is a monitoring component.	H-GAC, TCEQ, other monitoring entities (BRA et al. as appropriate)

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
All Sources (DO)	IA 1.6: Provide Flow Data Capability	See Appendix D for discussion of DO load reduction expectations.	Technical engineering review will be needed for proper flow measurement device selection and siting. Funding need will vary based on selected solution.	H-GAC will coordinate with stakeholders and engineering consultant (if needed) and disseminate information.	2012-2017	H-GAC will work with the stakeholders and appropriate consultants to select and install a flow data solution in each assessment reach by 2017.	Progress will be indicated by the installation of a flow data solution in each assessment reach.	Monitoring of flow level change may be necessary to ensure proper siting.	H-GAC, BRA, stakeholders involved with surface water supply/ transport.
All Sources (Bacteria and DO)	IA 2.1: Evaluate Potential Flow Regime Changes	No load reduction estimated for this activity (supports other IAs).	H-GAC staff time and in-house data analysis resources will be utilized for this IA.	H-GAC will disseminate information to stakeholders and coordinate with GCWA and water diverters.	2012-2014	H-GAC will have conducted a study with local partners over the 2012-2014 period to encapsulate impact of surface water conversion.	Progress will be indicated by a successfully completed flow study.	Monitoring of flow level change will be combination of future flow data capacity (IA 1.6), pumpage data from the BRA, rainfall data from the nearest available gauges, and withdrawal information from surface water users.	H-GAC, GCWA, Surface water users (City of Sugar Land, et al.)
Avian Wildlife (Bacteria)	IA 2.2: Assess Avian and Bat Populations	No load reduction estimated for this activity (supports other IAs).	Biological field monitoring expertise will be needed; assumed need for external consultant.	H-GAC will coordinate with biological consultant, and disseminate information to the stakeholders.	2012-2014	H-GAC and consultant will have conducted the assessments and produced results for the stakeholders by 2014.	Progress will be indicated by a successfully completed avian and bat assessment study.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	H-GAC, TCEQ, contractor.

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
All Sources (Bacteria and DO)	IA 2.3: Evaluate Future Sampling Data	No load reduction estimated for this activity (supports other IAs).	H-GAC staff time and in-house data analysis resources will be utilized for this IA.	H-GAC will disseminate information to stakeholders, and coordinate with data sources.	2012-2022	H-GAC will evaluate the data every year.	Progress will be indicated by the successful completion of each annual data review and report.	Monitoring data for this activity will be provided by existing monitoring efforts (IA 1.3) and additional monitoring (e.g., IA 1.5).	H-GAC, TCEQ
Feral Hogs (Bacteria)	IA 3.1: Deliver the LSHS Feral Hog Component	An estimated 2% reduction in overall bacteria loading is expected in total from IAs 3.1-3.4.	Texas AgriLife staff will be needed to deliver the Feral Hog component which operates under existing funding. Funding to deliver the program component in Upper Oyster Creek is expected to be covered under an EPA grant proposal currently being sought by TSSWCB and AgriLife Extension for FY 2013/2014.	Activity is an education component. Outreach will be handled in coordination with TSSWCB, H-GAC, and AgriLife Extension.	2012-2017	H-GAC will coordinate with AgriLife to have at least two workshops by 2017.	Progress will be indicated by holding two workshops within this period.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	H-GAC, TSSWCB, SWCDs, NRCS, Texas AgriLife

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Urban Stormwater (Bacteria)	IA 3.2: Continue and Expand Existing Urban/Suburban Education and Outreach	An estimated 2% reduction in overall bacteria loading is expected in total from IAs 3.1-3.4.	Education will be necessary to provide teachers, elected officials, and organizational staff with the tools to expand and continue existing outreach programs. Additional funding may be necessary for promotional and educational materials.	Activity is an education component. Outreach will be handled in coordination with H-GAC, stakeholders, and interested parties.	2012-2022	Local MS4 permittees will file annual reports on their activities. H-GAC will augment this information in a biennial report with other recorded efforts from the stakeholders.	Progress will be indicated by the extent and success of activities reported on in MS4 permits, and as compiled by H-GAC for a biennial report.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	All
Agriculture, Livestock (Bacteria)	IA 3.3: Expand Livestock Education Programs	An estimated 2% reduction in overall bacteria loading is expected in total from IAs 3.1-3.4.	Existing technical expertise (e.g., TSSWCB's LSHS Program Grazing Cattle Component) is sufficient to conduct education. Funding to deliver the program component in Upper Oyster Creek is expected to be covered under an EPA grant proposal currently being sought by TSSWCB and AgriLife Extension for FY 2013/2014.	Activity is an education component. Outreach will be handled in coordination with H-GAC, TSSWCB, AgriLife Extension, stakeholders, and the public.	2012-2017	H-GAC will work with TSSWCB or other content providers to implement at least two additional programs by 2017.	Progress will be indicated by the implementation of two livestock education programs prior to 2017 that meets the needs of the watershed's agricultural producers, as evidenced by participation.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	TSSWCB, SWCDs, NRCS, AgriLife, TWRI, youth agricultural groups, H-GAC

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
All Sources (Bacteria and DO)	IA 3.4: Continue and Expand Stream Team Volunteer Sampling	An estimated 2% reduction in overall bacteria loading is expected in total from IAs 3.1-3.4.	Additional funding for Stream Team Volunteers will be needed, based on response. Existing training and analysis capacity exists under H-GAC/CRP.	This activity is an education and outreach focused activity.	2012-2022	Texas Stream Team will add at least five more volunteers by 2015.	Progress will be indicated by the number of Texas Stream Team volunteer samplers added in the watershed.	The Texas Stream Team is a monitoring activity.	Texas Stream Team, H-GAC, BRA
Urban Stormwater (Bacteria)	IA 4.1: Implement New Ur-Ur-ban/Suburban Educational Efforts	An estimated 2% reduction in overall bacteria loading is expected in total from IAs 4.1, 4.2, and 4.4.	Existing technical expertise among stakeholders is sufficient. Additional funding will be needed for promotional materials.	Activity is an education component. Outreach will be handled in coordination with H-GAC, stakeholders, and interested parties.	2012-2022	Stakeholder organizations will implement at least one new program before 2017, and a second new program before 2022.	Progress will be indicated by the development and implementation of one new educational effort for each time period, as indicated in the milestones.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	All
Human Waste, OSSFs (Bacteria)	IA 4.2: Conduct Residential OSSF Education Program(s)	An estimated 2% reduction in overall bacteria loading is expected in total from IAs 4.1, 4.2, and 4.4.	Existing technical expertise among stakeholders is sufficient. Additional funding will be needed for promotional materials.	Activity is an education component. Outreach will be handled in coordination with H-GAC, stakeholders, and residents. One or more educational seminars/workshops will be held.	2012-2022	H-GAC and the stakeholder organizations will hold at least one program by 2017, and at least one program between 2017 and 2022.	Progress will be indicated by the successful hosting of a well-attended OSSF education program.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	H-GAC, TREC, Real estate professionals, Home inspectors

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Urban Stormwater (DO)	IA 4.3: Hold Lawn Maintenance Workshop	See Appendix D for discussion of DO load reduction expectations.	Existing technical expertise among stakeholders is sufficient. Additional funding will be needed for promotional materials.	Activity is an education component. Outreach will be handled in coordination with H-GAC, stakeholders, and residents.	2012-2017	H-GAC will coordinate with the stakeholder organizations to hold at least one workshop by 2017.	Progress will be indicated by the successful hosting of a well-attended lawn maintenance education program.	No water quality monitoring is specifically associated with this activity. Ambient water quality collected under the CRP and MS4 permits will continue to be used to assess the impact of the I-Plan in general.	All
All Sources (Bacteria and DO)	IA 4.4: Hold Benefit Concert	An estimated 2% reduction in overall bacteria loading is expected in total from IAs 4.1, 4.2, and 4.4.	Event planning services will be needed, in conjunction with venue staff. Additional sponsorships may be necessary depending on event revenues.	Activity is an education component. Outreach will be handled in coordination with H-GAC, sponsors, venue. Educational aspect will be speaker and/or announcements and booth, promotional presence.	2012-2014	H-GAC will coordinate with public and private interests to hold a benefit concert between 2012 and 2014. Specific milestones include an agreement with a venue, obtaining sponsorships sufficient to the purpose, and holding the concert.	Progress will be indicated by 1) an agreement with a local venue, 2) the number and amount of sponsorships garnered, and 3) a well-attended concert.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	All

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Urban Stormwater (Bacteria)	IA 5.1: Coordinate with New Development	An estimated 5% reduction in bacterial load assigned to urban nonpoint sources (1.22% reduction of total load) is expected in total from IAs 5.1, 5.2, 5.3 and 5.4	Existing technical expertise among stakeholders is sufficient. Additional funding may be needed for promotional materials.	Education will be handled through watershed governments, including educational discussions during new development discussions, and promotional materials.	2012-2022	H-GAC will produce materials for local governments between 2012 and 2017. H-GAC will work with at least two developers, municipalities or other local interests between 2017 and 2022.	Progress will be indicated by 1) the number of meetings held with local entities and/or the development community, and 2) the number of new developments that incorporate LID or similar features.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	H-GAC, North Fort Bend Water Authority, Fort Bend Subsidence District, Educators, Governmental Entities, Developers
All Sources (Bacteria and DO)	IA 5.2: Coordinate Dredging and Invasive Plant Management	See Appendix D for discussion of DO load reduction expectations.	Existing technical expertise among stakeholders is sufficient. Additional or continued funding for existing or enhanced dredging and invasive plant management may be necessary dependent on coordination outcomes between the parties.	H-GAC will facilitate discussions between appropriate parties and disseminate materials as requested to support coordination activities.	2012-2015	H-GAC will hold at least one coordination meeting by 2013.	Progress will be indicated by the successful completion of a coordination meeting, and subsequently by successful agreement between parties regarding coordination of maintenance activities.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Fort Bend County Drainage District, Municipalities, GCWA, H-GAC

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Urban Stormwater (Bacteria)	IA 5.3: Support Working with TCEQ to Allow Water Quality Feature Reimbursement	An estimated 5% reduction in bacterial load assigned to urban nonpoint sources (1.22% reduction of total load) is expected in total from IAs 5.1, 5.2, 5.3 and 5.4	No additional technical or financial resources needed for this activity.	H-GAC will coordinate with the BIG and interested parties to provide TCEQ and other relevant parties with requisite information to make this case.	2012-2014	Milestones are based on the BIG. H-GAC will coordinate with the BIG's efforts throughout the project period.	Progress will be indicated by the submittal of a proposal to TCEQ on behalf of the Oyster Creek and BIG project stakeholders.	Monitoring for this activity will be limited to acquisition of existing data from Harris County and other entities who have previously addressed this issue with TCEQ.	All
Urban Stormwater (Bacteria)	IA 5.4: Recommend Expansion of Dog Parks and Installing Dog Waste Stations	An estimated 5% reduction in bacterial load assigned to urban nonpoint sources (1.22% reduction of total load) is expected in total from IAs 5.1, 5.2, 5.3 and 5.4	No additional technical or financial resources needed for the coordination of this activity. Municipalities may require additional funding for increasing dog park capacity, and may need engineering services if their internal resources are not sufficient.	Promotional and educational materials will be provided to governments/ developers and maintained on a project website.	2012-2022	Municipalities, districts, private developments, or the County will add or expand at least one dog park area by 2022.	Progress will be indicated by the number of dog parks or dog-specific areas added or expanded within the watershed.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	H-GAC, Developers, Governmental entities
All Sources (DO)	IA 5.5: Promote Aeration Reimbursement	See Appendix D for discussion of DO load reduction expectations.	No additional technical or financial resources needed for this activity.	H-GAC will coordinate with interested parties to provide TCEQ and other relevant parties with requisite information to make this case.	2012-2014	H-GAC will make a proposal to TCEQ prior to 2014.	Progress will be indicated by the submittal of a proposal to TCEQ on behalf of the UOC stakeholders.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	TCEQ, Fort Bend County, H-GAC

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
All Sources (DO)	IA 5.6: Add Aeration Capacity to Waterways	See Appendix D for discussion of DO load reduction expectations.	Engineering consideration will be needed for siting/method selection and additional funding may be necessary depending on outcome of engineering review.	H-GAC will coordinate with stakeholders to promote this practice in new development; H-GAC will assist in outreach to stakeholders in evaluating additional options.	2014-2022	Stakeholder organizations will identify and add at least one aeration solution by 2022.	Progress will be indicated by the number of aeration features added within the watershed.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	All
Urban Stormwater (DO)	IA 5.7: Promote Domestic Oil Recycling Programs	See Appendix D for discussion of DO load reduction expectations.	No additional technical resources needed. Additional funding may be needed for organizations without existing recycling programs, and for promotional materials.	Programs will be coordinated through the local entity owning the program. H-GAC will assist in providing sample promotional materials and disseminating information to the community.	2012-2022	H-GAC will develop a model program and materials by 2017, and implement in one new location by 2022.	Progress will be indicated by the successful development and dissemination of promotional materials. A secondary indicator is the number of domestic oil recycling programs implemented.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	All

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Urban Stormwater (DO)	IA 5.8: Hold HHW Collection Event	See Appendix D for discussion of DO load reduction expectations.	No additional technical resources needed; cooperative funding will be needed to host event.	Programs will be coordinated through the local entities funding the program. H-GAC will assist in providing promotional materials and disseminating information to the communities.	2012-2017	H-GAC will coordinate with watershed stakeholders to fund and hold at least one event by 2017.	Progress will be indicated by a well-attended household hazardous waste program being held by one or more stakeholder organizations.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	All
Urban Stormwater (Bacteria)	IA 6.1: Continue MS4 Phase II Activities	An estimated 15% reduction in bacterial load assigned to urban nonpoint sources (3.65% reduction of total load) is expected in total from IAs 6.1, 6.2, and 6.3	Sufficient expertise exists among H-GAC and stakeholders to serve this activity. Additional financial resources may be needed if permittees expand programs.	Phase II MS4 permits include educational components. Individual permittees will continue existing educational efforts, and H-GAC will provide additional materials and program ideas as appropriate.	2012-2022	MS4 permittees will report on their activities in their annual reports. H-GAC will compile this information in a biennial report.	Progress will be indicated by the content of MS4 annual reports from the watershed stakeholders.	Monitoring for this activity will comprise the activities conducted by the MS4 permittees in their programs, and the general ambient data provided by the CRP.	MS4 permittees, H-GAC

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Urban Stormwater (Bacteria)	IA 6.2: Develop Model Ordinances for Pet Waste and Waste Haulers	An estimated 15% reduction in bacterial load assigned to urban nonpoint sources (3.65% reduction of total load) is expected in total from IAs 6.1, 6.2, and 6.3	Existing technical expertise, staff time, among stakeholders is sufficient.	H-GAC will provide and promote a model ordinance(s).	2012-2013	H-GAC will develop and make available model ordinances for pet waste and waste haulers by 2013.	Progress will be indicated by the successful development and dissemination of promotional materials. A secondary indicator is the number of entities that enact these or similar ordinances.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	H-GAC, Municipalities
Urban Stormwater (Bacteria and DO)	IA 6.3: Enforce Existing Requirements	An estimated 15% reduction in bacterial load assigned to urban nonpoint sources (3.65% reduction of total load) is expected in total from IAs 6.1, 6.2, and 6.3	Existing technical expertise, staff time, among stakeholders is sufficient. Locating potential additional funding is part of activity.	Individual entities will continue enforcement efforts, and H-GAC will provide support as appropriate. Education may be part of the entity's enforcement program.	2012-2022	This activity is conducted as needed. No specific milestones are projected.	Progress will be indicated by the content of MS4 annual reports from the watershed stakeholders.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	TCEQ, MS4 permittees
Agriculture, Livestock and Pigs (Bacteria)	IA 7.1: Continue TDCJ Farm Property Practices and Swine CAFO	A 20% reduction in load assigned to livestock (2.64% reduction of total load) is expected in total from activities 7.1 and 7.2.	Existing TDCJ technical expertise and resources are sufficient.	These are regulated activities, and no additional education component is necessary.	2012-2022	TDCJ will report on their permit activities as appropriate. H-GAC will compile this information, if needed, for the biennial report.	Progress will be indicated by the context of the TDCJ reports on permit activities, as compiled by H-GAC.	Water quality monitoring is conducted as required by the TDCJ's CAFO permit program.	TDCJ

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Agriculture, Livestock (Bacteria)	IA 7.2: Promote and Implement Water Quality Management Plans and Agricultural Financial Incentive Programs	A 20% reduction in load assigned to livestock (2.64% reduction of total load) is expected in total from activities 7.1 and 7.2.	Existing TSSWCB and Coastal Plains SWCD # 317, technical resources are sufficient. Additional funding will be necessary dependent on extent of participation. Need for additional funding is dependent on the Texas legislature and the federal allocations from the Farm Bill.	H-GAC will work with TSSWCB, NRCS, et al. to promote their programs using their existing outreach materials, and watershed communication networks.	2012-2017	Implement at least one financial incentive activity by 2017.	Progress will be indicated by the implementation of financial incentive activities with watershed agricultural producers.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	NRCS, TSSWCB, SWCD # 317

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Feral Hogs (Bacteria)	IA 8.1: Promote Technical Assistance and Direct Operational Assistance to Landowners for Feral Hog Control	A 10% reduction in load assigned to pigs (0.57% reduction of total load) is expected in total from activities 8.1 and 8.2.	No additional technical resources needed; Additional grant money will be necessary for service providers, and individual landowners may need to provide funding for feral hog controls they implement on their properties. Need for additional funding may be dependent on the Texas legislature and the federal allocations from the Farm Bill.	H-GAC will work with Texas AgriLife to promote their program using their existing outreach materials, and watershed communication networks. This will coordinate with IA 3.1.	2012-2022	H-GAC will work with service providers to assist at least one producer by 2017, and at least one more by 2022.	Progress will be indicated by the number of property owners or agricultural producers who receive these services.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Texas AgriLife/ Texas Wildlife Services, TSSWCB

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Feral Hogs (Bacteria)	IA 8.2: Suggest Fort Bend County consider support of Feral Hog Eradication Program	A 10% reduction in load assigned to pigs (0.57% reduction of total load) is expected in total from activities 8.1 and 8.2.	No additional technical or financial resources needed to recommend/coordinate. Technical resources (AgriLife, et al.) may be needed for implementation of program. Additional financial resources will be needed for program implementation.	H-GAC will work with Fort Bend County and other interested parties in evaluating options, and promoting program elements to the community through materials, the project website, and existing communication networks as appropriate. This will be coordinated with IA 3.1.	2012-2014	H-GAC will make a proposal to Fort Bend County by 2014.	Progress will be indicated by the successful submittal of a proposal from the stakeholders to the County. A secondary indicator will be the addition of the program or elements thereof by the County.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Fort Bend County, H-GAC
Avian Wildlife (Bacteria)	IA 9.1: Investigate Avian Wildlife Management Options	A 20% reduction in load assigned to avian wildlife (4.64% of total load) is expected in total from IAs 9.1, 9.2, 9.3, and 9.4.	Engineering and biological control expertise will be needed to consider management options. Financial resources may be needed based on the potential need for external consultant.	H-GAC will coordinate with a consultant to disseminate information to the stakeholders regarding the options and recommendations, and receive feedback to inform recommendations.	2012-2014	H-GAC will work with a consultant to produce a report on options by 2014. H-GAC will disseminate and seek feedback regarding options from the stakeholders in the 6 months following the conclusion of the report.	Progress will be indicated by the successful completion of a study, and the approved recommendation of the stakeholders.	Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general. Acquired data from previous studies and ongoing TxDOT studies will be used to evaluate the relative loading potential of the avian wildlife.	H-GAC, TSSWCB, Texas AgriLife, USDA NRCS

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Avian Wildlife (Bacteria)	IA 9.2: Implement Pigeon Exclusion Practices	A 20% reduction in load assigned to avian wildlife (4.64% reduction of total load) is expected in total from IAs 9.1, 9.2, 9.3, and 9.4.	Engineering and biological control expertise will be needed to implement pigeon management. Financial resources may be needed based on the potential need for external consultant.	H-GAC will work with interested localities to assist in promoting pigeon exclusion programs or public behavior change regarding pigeon food sources.	2014-2022	Implement pigeon exclusion at one or more locations by 2017. Implement pigeon exclusion at one other location by 2022.	Progress will be indicated by the number of pigeon exclusion projects implemented.	Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general. Acquired data from previous studies and ongoing TxDOT studies will be used to evaluate the relative loading potential of the avian wildlife.	H-GAC, Fort Bend County, Municipalities, Districts, Developers.
Avian Wildlife (Bacteria)	IA 9.3: Implement Domestic Duck Removal	A 20% reduction in load assigned to avian wildlife (4.64% reduction of total load) is expected in total from IAs 9.1, 9.2, 9.3, and 9.4.	Biological control expertise will be needed to implement duck management. Financial resources may be needed based on the potential need for external consultant.	H-GAC will work with interested localities to assist in promoting domestic duck mitigation programs or public behavior change regarding feeding ducks.	2014-2022	Implement duck removal at one or more sites by 2017. Add at least one additional site by 2022.	Progress will be indicated by the number of domestic duck mitigation projects implemented.	Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general. Acquired data from previous studies and ongoing TxDOT studies will be used to evaluate the relative loading potential of the avian wildlife.	All

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Avian Wildlife (Bacteria)	IA 9.4: Implement Swallow Exclusion Practices	A 20% reduction in load assigned to avian wildlife (4.64% reduction of total load) is expected in total from IAs 9.1, 9.2, 9.3, and 9.4.	Biological control and/or engineering expertise will be needed to implement swallow management. Financial resources may be needed based potential need for external consultant.	H-GAC will work with responsible parties to inform the public of all program aims, and provide education through public meetings and the project website about the potential need for swallow exclusion, and the methods chosen.	2014-2022	Implement swallow exclusion on at one or more bridges by 2017. Add at least one additional site by 2022.	Progress will be indicated by the number of swallow exclusion projects implemented.	Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general. Acquired data from previous studies and ongoing TxDOT studies will be used to evaluate the relative loading potential of the avian wildlife.	H-GAC, Fort Bend County, Municipalities, Districts
Human Waste, WWTFs (Bacteria)	IA 10.1: Recommend to WWTFs Without Limits to Begin Sampling Now	A 10% reduction in load assigned to WWTFs and collection systems (1.32% reduction of total load) is expected in total from IAs 10.1, 10.2, 10.3, 10.4 and 10.5.	No additional resources are needed to make a recommendation. Additional financial resources will be needed for WWTFs who expand sampling.	H-GAC will work with local utilities to educate plant operators on the benefits of testing early. Education and promotion will be through meetings and personal contact.	2012-2014	H-GAC will work with at least one utility to sample prior to bacteria limits being added to the utility's permit.	Progress will be indicated by the number of utilities who begin sampling for bacteria prior to the addition of limits to their permits.	This activity is a monitoring component. Specifically, this relates to the additional monitoring for fecal indicator bacteria.	Wastewater utilities, H-GAC
Human Waste, WWTFs (Bacteria)	IA 10.2: Increase Compliance and Enforcement by TCEQ	A 10% reduction in load assigned to WWTFs and collection systems (1.32% reduction of total load) is expected in total from IAs 10.1, 10.2, 10.3, 10.4 and 10.5.	No additional resources are needed to make a recommendation. Additional financial resources will be needed for expanded TCEQ enforcement.	H-GAC will provide support as appropriate for requests to TCEQ for additional enforcement capacity through data analysis and dissemination.	2012-2022	H-GAC will make a proposal to TCEQ regarding enforcement needs by 2014.	Progress will be indicated by the increase in TCEQ enforcement capacity, in full time employees.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	TCEQ

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Human Waste, WWTFs (Bacteria)	IA 10.3: Encourage Wastewater Reuse	A 10% reduction in load assigned to WWTFs and collection systems (1.32% reduction of total load) is expected in total from IAs 10.1, 10.2, 10.3, 10.4 and 10.5.	No additional resources are needed to make a recommendation. Additional financial resources will be needed for reuse implementation.	H-GAC will work with the AWBD, local utilities and other interested parties to disseminate information on potential benefits and funding sources for reuse applications.	2012-2022	H-GAC will compile materials for its project website by 2014. H-GAC will work with at least two utilities prior to 2017 to encourage reuse, as appropriate.	Progress will be indicated by the number of utilities who evaluate wastewater reuse as an option.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Wastewater utilities
Human Waste, WWTFs (Bacteria)	IA 10.4: Consider Stricter Bacteria Standards if Data Indicates Necessary	A 10% reduction in load assigned to WWTFs and collection systems (1.32% reduction of total load) is expected in total from IAs 10.1, 10.2, 10.3, 10.4 and 10.5.	No additional resources are needed to make a recommendation. H-GAC staff time and data analysis resources are sufficient to analyze related data.	H-GAC will review and disseminate data to stakeholders. Stakeholders will decide on recommendations, and H-GAC will convey recommendations, along with supporting data, to TCEQ.	2017-2022	H-GAC will conduct an assessment of available data in 2017. H-GAC will report on the data assessment in 2017.	Progress will be indicated by the successful completion of the 2017 data review and the formation of approved recommendation s from the stakeholders.	The monitoring that will inform this decision is based on TCEQ evaluation of regulated facilities, and self-reported testing data from the dischargers.	Wastewater utilities
Human Waste, WWTFs (Bacteria)	IA 10.5: Recommend WWTFs Assess Design and Operation Criteria	A 10% reduction in load assigned to WWTFs and collection systems (1.32% reduction of total load) is expected in total from IAs 10.1, 10.2, 10.3, 10.4 and 10.5.	No additional resources are needed to make a recommendation. WWTF staff time and expertise needed to make assessments.	H-GAC will maintain example UAMPs/SOPs and other resources on the project website.	2012-2017	H-GAC will coordinate with at least ten facilities to conduct assessments by 2017.	Progress will be indicated by the number of utilities who evaluate their utility operations and design criteria.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Wastewater utilities

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Human Waste, WWTFs (DO)	IA 10.6: Recommend Polishing Pond Standards	See Appendix D for discussion of DO load reduction expectations.	No additional resources are needed to make a recommendation.	H-GAC will work with interested parties to provide TCEQ with pertinent information on this topic.	2012-2017	H-GAC will make a proposal to TCEQ prior to 2015.	Progress will be indicated by the formation of an approved recommendation to TCEQ from the watershed stakeholders.	Monitoring from existing polishing pond locations will be utilized, if appropriate, to inform recommendations. There is no specific monitoring proposal to evaluate the efficacy of the recommendation after the fact.	TCEQ
Human Waste, WWTFs (DO)	IA 10.7: Recommend Additional Nutrient Sampling	See Appendix D for discussion of DO load reduction expectations.	No additional resources are needed to make a recommendation. Additional sampling costs will apply to participating entities.	H-GAC will disseminate information to utilities regarding the benefits of additional nutrient sampling.	2012-2017	H-GAC will recommend additional nutrient sampling to all watershed utilities by 2013. At least one local utility or water quality monitoring entity will engage in additional nutrient sampling by 2017.	Progress will be indicated by the number of utilities who engage in additional nutrient sampling.	This activity is a monitoring component of the I-Plan.	Wastewater utilities, TCEQ

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Human Waste, WWTFs (DO)	IA 10.8: Incorporate BMP Monitoring from Development	See Appendix D for discussion of DO load reduction expectations.	No additional resources are needed to make a recommendation. H-GAC, TCEQ and development staff time and expertise needed to conduct and incorporate data.	H-GAC will facilitate communication between TCEQ and private interests.	2012-2017	H-GAC will make a proposal to TCEQ by 2014.	Progress will be indicated by the formation of a proposal to TCEQ regarding this data. A secondary indicator will be the number of sampling projects that provide data.	This activity is a monitoring component of the I-Plan.	TCEQ
Human Waste, Sanitary Sewer Collection Systems (Bacteria)	IA 11.1: Strengthen Controls on Subscriber Systems	A 20% reduction in load assigned to WWTFs and collection systems (2.64% reduction of total load) is expected in total from IAs 11.1, 11.2, 11.3, 11.4, 11.5 and 11.6.	No additional resources are needed to make a recommendation. H-GAC, TCEQ staff time and expertise needed to review and decide.	H-GAC will work to identify and analyze subscriber systems, and disseminate the information as appropriate.	2012-2022	H-GAC, in conjunction with the BIG, will compile GIS data on subscriber systems by 2017.	Progress will be indicated by the successful completion of a GIS dataset and related information on subscriber systems. A secondary indicator will be the success of the BIG's effort to petition the TCEQ for rulemaking to require registration of subscriber systems.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	TCEQ

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Human Waste, Sanitary Sewer Collection Systems (Bacteria)	IA 11.2: Penalties for SSOs	A 20% reduction in load assigned to WWTFs and collection systems (1.32% reduction of total load) is expected in total from IAs 11.1, 11.2, 11.3, 11.4, 11.5 and 11.6.	No additional resources are needed to make a recommendation. H-GAC, TCEQ staff time and expertise needed to review and decide.	H-GAC will work with interested parties to provide TCEQ with pertinent information on this topic.	2012-2022	H-GAC will make a proposal to TCEQ by 2014.	Progress will be indicated by the submittal of an approved proposal to the TCEQ.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	TCEQ
Human Waste, Sanitary Sewer Collection Systems (Bacteria)	IA 11.3: Evaluate Fats, Oils and Grease Requirements	A 20% reduction in load assigned to WWTFs and collection systems (2.64% reduction of total load) is expected in total from IAs 11.1, 11.2, 11.3, 11.4, 11.5 and 11.6.	No additional resources are needed to make a recommendation. H-GAC staff time, utility staff time and potential legal consideration needed for utilities to evaluate adding/revising FOG requirements.	H-GAC will work directly with utilities to educate them, provide sample materials. Materials will be maintained on the project website.	2012-2017	At least three utilities will evaluate their requirements by 2017.	Progress will be indicated by the number of utilities who formally evaluate and/or improve their programs.	Monitoring for this activity may be acquired from the DMRs from participating utilities. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Wastewater utilities

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Human Waste, Sanitary Sewer Collection Systems (Bacteria)	IA 11.4: Develop Utility Asset Management Program	A 20% reduction in load assigned to WWTFs and collection systems (2.64% reduction of total load) is expected in total from IAs 11.1, 11.2, 11.3, 11.4, 11.5 and 11.6.	No additional resources are needed to make a recommendation. H-GAC staff time, utility staff time and potential legal consideration needed for utilities to evaluate UAMP addition.	H-GAC will work directly with utilities to educate them and provide sample materials. Materials will be maintained on the project website.	2012-2017	H-GAC, in conjunction with the BIG, will make sample UAMP materials available on the project websites prior to 2014. H-GAC will work with at least one watershed utility to evaluate or modify their program to use UAMP elements by 2017.	Progress will be indicated by the number of utilities who incorporate a UAMP or elements thereof.	Monitoring for this activity may be acquired from the DMRs from participating utilities. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Wastewater utilities
Human Waste, Sanitary Sewer Collection Systems (Bacteria)	IA 11.5: Encourage Appropriate Mechanisms to Maintain Lift Station Function	A 20% reduction in load assigned to WWTFs and collection systems (2.64% reduction of total load) is expected in total from IAs 11.1, 11.2, 11.3, 11.4, 11.5 and 11.6.	No additional resources are needed to make a recommendation. Utility staff time and potentially engineering consideration and additional capital funding are needed to implement additional backup mechanisms.	H-GAC will work directly with utilities to educate them, provide sample materials. Materials will be maintained on the project website.	2013-2017	H-GAC will recommend lift station capacity evaluation and upgrade to all utilities in the watershed by 2014. At least one utility will evaluate and upgrade (if appropriate) their lift station capacity by 2017.	Progress will be indicated by the number of lift stations for which backup power or other mechanism (e.g. mobile bypass pumping capacity) is provided.	Monitoring for this activity may be acquired from the DMRs from participating utilities. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Wastewater utilities

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Human Waste, Sanitary Sewer Collection Systems (Bacteria)	IA 11.6: Support the Development of Streamlined SSO Reporting Database	A 20% reduction in load assigned to WWTFs and collection systems (2.64% reduction of total load) is expected in total from IAs 11.1, 11.2, 11.3, 11.4, 11.5 and 11.6.	No additional resources are needed to make a recommendation. H-GAC, TCEQ staff time and expertise are needed to review and decide.	H-GAC will maintain information on the BIG's website, and disseminate information to stakeholders via e-mail or other appropriate means.	2012-2014	H-GAC will support the BIG on this activity, including formal recognition of support (if appropriate) prior to 2014.	Progress will be indicated by the development and implementation of the database, based on support of the BIG's efforts.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	TCEQ, Fort Bend County
Human Waste, OSSFs (Bacteria)	IA 12.1: Identify and Address Failing OSSFs	A 100% reduction in load assigned to OSSFs (0.99% reduction of total load) is expected in total from IAs 12.1, 12.2, 12.3, 12.4, and 12.5.	Engineering expertise will be needed to evaluate and design replacement or remediation of systems. Additional capital funding may be needed if costs are not borne by the property owner.	IA 4.2 serves as an educational component for this project. H-GAC will maintain materials on its project websites and coordinate with authorized agents as appropriate.	2012-2022	Authorized agents, in total, will address or cause to be addressed (repair, replace, or otherwise remediate) at least 15 malfunctioning OSSFs each year.	Progress will be indicated by the number of OSSFs addressed.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Authorized agents, residents, local governments, Sam Houston RC&D

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Human Waste, OSSFs (Bacteria)	IA 12.2: Address Inadequate Maintenance of OSSFs	A 100% reduction in load assigned to OSSFs (0.99% reduction of total load) is expected in total from IAs 12.1, 12.2, 12.3, 12.4, and 12.5.	No additional resources are needed to make a recommendations. Additional engineering expertise and capital funding may be needed to implement recommendations.	IA 4.2 serves as an educational component for this project. H-GAC will maintain materials on its project websites and coordinate with authorized agents as appropriate.	2012-2022	H-GAC will recommend to all authorized agents in the watershed that they review their programs. At least one authorized agent will review their OSSF permitting and management program by 2017; another will address their program by 2022.	Progress will be indicated by the number of authorized agents who actively review their programs, and/or make improvements.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Authorized agents
Human Waste, OSSFs (Bacteria)	IA 12.3: Continue to Submit/Compile OSSF Data	A 100% reduction in load assigned to OSSFs (0.99% reduction of total load) is expected in total from IAs 12.1, 12.2, 12.3, 12.4, and 12.5.	H-GAC and stakeholder staff time and expertise are sufficient for this task.	H-GAC will maintain this information in its online mapping resources and projects websites. The developed database will be promoted to stakeholders and authorized agents through e-mail and in person at conferences and other professional venues.	2012-2022	H-GAC will revise its OSSF data, as appropriate, on an annual basis. H-GAC will add mapping data for unregulated systems by 2014. Authorized agents will submit data annually starting in 2014.	Progress will be indicated by the successful annual data revisions, and the inclusion of unregulated systems data to the OSSF GIS.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Authorized agents, H-GAC

Causes and Sources	Implementation Activities and Targeted Critical Areas	Estimated Potential Load Reduction[52]	Technical and Financial Assistance Needed	Education Component	Schedule of Implementation[53]	Interim, Measurable Milestones	Indicators to Measure Progress	Monitoring Component	Responsible Party[54]
Human Waste, OSSFs (Bacteria)	IA 12.4: Utilize SEP Program Funds for OSSF Remediation	A 100% reduction in load assigned to OSSFs (0.99% reduction of total load) is expected in total from IAs 12.1, 12.2, 12.3, 12.4, and 12.5.	H-GAC and stakeholder staff time and expertise are sufficient for this task.	IA 4.2 serves as an educational component for this project. H-GAC will maintain materials on its project websites and coordinate with authorized agents as appropriate.	2012-2014	H-GAC will develop resident applications for an existing SEP program prior to 2014.	Progress will be indicated by the completion of SEP requests and the number of facilities remediated as part of that project.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	All
Human Waste, OSSFs (Bacteria)	IA 12.5: Consider Permit Renewal Fee/Permit Transfer Fee	A 100% reduction in load assigned to OSSFs (0.99% reduction of total load) is expected in total from IAs 12.1, 12.2, 12.3, 12.4, and 12.5.	No additional resources are needed to make a recommendation. H-GAC, TCEQ, authorized agents staff time and expertise are needed to review and decide.	H-GAC will work directly with authorized agents, and maintain materials on its project websites.	2017-2022	H-GAC will recommend to all authorized agents the consideration of a permit renewal or permit transfer fee in 2017. H-GAC will make model fee programs or ordinances available on its website by 2017.	Progress will be indicated by the number of authorized agents who actively review their programs, and/or make improvements regarding fee structure.	No water quality monitoring is associated with this activity. Ambient water quality collected under the CRP will continue to be used to assess the impact of the I-Plan in general.	Authorized agents, H-GAC

Appendix F.
Public Involvement and Public Outreach

H-GAC staff attempted to include all interested participants during the development of the I-Plan for the Upper Oyster Creek TMDL. Newspaper releases, along with numerous phone calls and e-mails to reach out to various groups were done to drive interest and encourage participation. The stakeholders that attended the first I-Plan meeting decided that a Coordinating Committee would be formed and would serve as the decision-making group for the plan. After taking nominations, the committee was formed by 14 local stakeholders representing a variety of interests. The committee included representatives from utility districts, cities, regional and state agencies, private industry, environmental interests, and concerned citizens.

Monthly meetings were held in the City of Sugar Land between February 2011 and December 2011, with the exception of September, October, and November of 2011. A quorum was reached at every meeting, which was required in order to make official decisions. The committee utilized a consensus-based decision-making process, and public meetings generally had 20 to 30 attendees.

Four Work Groups were formed and met monthly subsequent to the Coordinating Committee schedule (and exceptions) noted above, during weeks where there was not a public meeting. Each Work Group had at least one Coordinating Committee member serve, but this was a direct way for both Committee and non-Committee members to be vocal in the decision-making process in a smaller, more focused setting. The Committee members used the information generated during the Work Group meetings to inform the rest of the committee on specific tasks and topics.

H-GAC staff utilized the direction given by the Work Groups and Coordinating Committee to assemble feasible implementation strategies and specific activities. The committee ranked and prioritized the activities in order of perceived effectiveness and feasibility for implementation in the watershed based on stakeholder preference. These activities are listed in this I-Plan, which will be the driving force for reducing bacteria levels and improving DO concentrations.

Following the review and preliminary approval by the Coordinating Committee, the I-Plan entered a public comment period for stakeholders and their organizations. H-GAC staff reviewed and incorporated all comments in the I-Plan. The draft I-Plan was submitted to TCEQ for preliminary review, and peer review was sought from the TSSWCB. H-GAC compiled the agency comments and, facilitated a coordination meeting between TCEQ and TSSWCB. Subsequently, the changes identified in this process were submitted, with proposed actions, to the Coordinating Committee for review and concurrence. H-GAC incorporated the agency changes, as approved by the stakeholders. Opportunities for involvement did not end after this I-Plan was submitted to the TCEQ for formal approval. As part of the TCEQ review during the approval process, a formal public comment period

and public meeting were held to seek additional comment on the revised I-Plan draft.

As this I-Plan is continually adapting, there will be continued stakeholder involvement and oversight. In order for this I-Plan to be effective in achieving its goals, implementation of the described activities, in addition to new activities not listed, must be carried out.

Response to Public Comment on
Implementation Plan for Two Total Maximum Daily Loads for Dissolved Oxygen and One Total Maximum Daily Load for Bacteria in Upper Oyster Creek

(Segment 1245)

December 20, 2013

Tracking Number	Date Received	Affiliation of Commenter	Request or Comment	Summary of TCEQ Action or Explanation
001_01	10/2/2013	Texas Department of Transportation (TxDOT) (written – e-mail)	TxDOT comments that the implementation scheduling statement on page 39 for IA 9.2, regarding pigeon exclusion devices to be installed, is misleading. At this time, TxDOT does not plan to install avian deterrent devices on any existing and future bridges. Research conducted by TxDOT determined that only active avian deterrents were effective in keeping birds from roosting on some TxDOT bridges. These active avian deterrent devices are very expensive and require the use of electricity to run them at all times. At rural bridge locations, where electricity is not available, these types of devices are not feasible. Additionally, further research is still needed to determine if these types of active deterrent devices will affect bystanders that may be using the nearby facilities, such as hike & bike trails, adjacent to the bridge.	The TCEQ appreciates the comment. During the development of Implementation Activities (IA) for the draft Implementation Plan (I-Plan), TxDOT provided useful information regarding birds and bats residing in bridges. This comment includes updated information based on research that was ongoing during the development of the draft I-Plan. In response to the comment, the I-Plan was revised to indicate that TxDOT infrastructure will not be considered for implementation sites for avian deterrent devices. *See* sections 9.1, 9.2 and 9.4, as well as Table E.1.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

A RESOLUTION

approving the final *Implementation Plan for two Total Maximum Daily Loads (TMDLs) for dissolved oxygen and one Total Maximum Daily Load (TMDL) for bacteria in Upper Oyster Creek (Segment 1245) in Fort Bend County*.
TCEQ Docket No. **2013-0852-TML**
TCEQ Project No. **2013-005-TML-NR**

WHEREAS, the Executive Director developed two TMDLs for dissolved oxygen and one TMDL for bacteria in Upper Oyster Creek (Segment1245) and presented them for consideration by the Texas Commission on Environmental Quality Commission (Commission) during the Commission's public meetings on August 8, 2007 and July 28, 2010;

WHEREAS, the Commission found that the two TMDLs for oxygen and one TMDL for bacteria in Upper Oyster Creek (Segment 1245) complied with all applicable state and federal law and regulations; and accordingly, the Commission adopted on August 8, 2007 and July 28, 2010, the TMDLs for oxygen and bacteria in Upper Oyster Creek (Segment 1245) and submitted them to the EPA for approval;

WHEREAS, in order to comply with the "Implementation and Reasonable Assurance" section of the TMDLs, the Executive Director developed a draft Implementation Plan for the adopted TMDLs for oxygen and bacteria in Upper Oyster Creek (Segment 1245) and presented them for the Commission's consideration during its January 15, 2014, public meeting at which the Commission approved the Implementation Plan;

NOW, THEREFORE, it is resolved by the Commission that the Implementation Plan for two TMDLs for dissolved oxygen and one TMDL for bacteria in Upper Oyster Creek (Segment 1245) are APPROVED.

Issue Date: TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

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Bryan W. Shaw, Ph.D.
Chairman