Response to Public Comment

Eighteen Total Maximum Daily Loads for Bacteria in Buffalo and Whiteoak Bayous and Tributaries

Tracking Number	Date Received	Affiliation of Commenter	Summary of Request or Comment	Summary of TCEQ Action or Explanation
001	7/1/08 7/3/08 7/3/08 7/3/08	Water Environment Association of Texas Greater Houston Builders Association Harris County Public Infrastructure Department Houston Council of Engineering Companies	**Follow Bacteria TMDL Task Force Report Recommendations**. The stakeholder process did not follow the recommendations contained in the *Bacteria TMDL Task Force Report* (Texas Water Resources Institute, 2007) and the resulting proposed document does not conform to Task Force recommendations. The Task Force was commissioned by the TCEQ and the TSSWCB in September 2006 and its final report was published June 4, 2007, after both TCEQ and Texas Soil and Water Conservation Board (TSSWCB) approved the document in joint session. The Joint Task Force report outlines three tiers of TMDL development and implementation and describes key decisions that must be made at the end of each development tier. At the end of each tier, the Task Force recommended that the calculated load reductions be evaluated to determine if they are socially and economically attainable. If reductions are deemed to not be socially and economically attainable, the Task Force recommended that the TCEQ complete a draft TMDL "that includes a recommended change in the designated use (i.e. Use Attainability Analysis)" (See p. 38 of the Task Force report). The proposed TMDLs do not include this element and stakeholders were not provided with any analysis of whether the proposed load reductions were socially and economically attainable. We believe that requiring load reductions of more than 95% is not economically attainable, particularly, with the region's high rainfall depths and intensities. We strongly urge TCEQ to modify the document to include consideration of these	The project was initiated in 2000, prior to the Task Force report; however, the project used three models that are recommended in the Task Force report. The tiered framework is intended to be flexible to ensure it best fits the complexity of the watershed sources, available data, degree of impairment, and level of accuracy required. The TCEQ has followed this concept through the development of the TMDL and has expressed the desire to continue following it during the development and implementation of the implementation plan (I-Plan). A stakeholder-driven implementation group, the Bacteria Implementation Group (BIG), has been formed to develop the implementation plan for *Nine Total Maximum Daily Loads for Bacteria in Buffalo and Whiteoak Bayous and Tributaries* along with all other TMDLs for bacteria in the Houston area. Social and economic impacts will be evaluated by the stakeholders that control the content of the plan. Priorities can be set, and the plan can be long term. Adaptive management should be an integral part of the plan to provide the maximum flexibility. The current approach to the development of the BIG, the excellent resources available to develop the plan, and the experience and expertise of the organizations and individuals involved ensures the best plan for all stakeholders.

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001 (cont.)			Task Force recommendations, including moving forward with watershed-specific use attainability analyses. This modification could be included in the "Implementation and Reasonable Assurances" section.	The "Implementation and Reasonable Assurances" section of the TMDL document has been revised to better describe the process for developing the implementation plan, noting that social and economic factors will be a consideration.
002	7/1/08	Water Environment Association of Texas	**Adjust Water Quality Target**. The proposed TMDLs are based on an inapplicable standard. The current water quality standard for contact recreation is based on fresh water lake studies; however, it has been inappropriately applied to creeks, streams, and bayous. The current standard is based on 9 experimental trials measuring lake bacteria levels, swimmer illness rates, and non-swimmer illness rates conducted in Oklahoma (keystone Lake) and Pennsylvania (Lake Erie) with different climate and aquatic conditions than those found in the Houston region. Seven of the 9 trials did not show a statistically significant difference in illness rates between swimmers and non-swimmers, yet these trials were used by EPA to derive the existing national criterion. The 9 trials revealed a moderate correlation between *E. coli* levels in the water and illness rates (0.72). However, the correlation between swimmer and non-swimmer illness rates was similar (0.67), suggesting that illness transmission could have occurred via routes other than from water exposure. This and other published criticisms of the EPA fresh water criteria (Haas, 2006; suggest that Texas and regional stakeholders should conduct research into this area to improve the technical basis for our contact water quality standards.	TCEQ must develop TMDLs for the water quality standards currently approved. We agree that the standards should be reviewed. The water quality targets are reviewed approximately every three years for all parameters. There is an ongoing stakeholder advisory group participating with TCEQ on considering revisions to recreational use categories and numerical criteria. It is TCEQ policy to review all completed TMDLs after each revision of the Texas Surface Water Quality Standards and to revise TMDLs as necessary.
			WEAT urges the TCEQ to modify the content of the "Implementation and Reasonable Assurances" section to include a brief mention of future research activities and the TCEQ's intent to modify the TMDL and the Water Quality Management Plan if new criterion is developed and adopted as a result of future research.	The "Implementation and Reasonable Assurances" section of the TMDL report was modified as requested to mention how implementation can be adjusted based on standards changes.

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003	7/1/08	Water Environment Association of Texas	**Consider Correct Use Designation**. The proposed TMDLs are based on a presumed use of contact recreation: swimming with a large risk of water ingestion. Recent census work funded by TCEQ and conducted by the Houston-Galveston Area Council (H-GAC), illustrates that even at riparian parks during favorable weather conditions there are no swimmers in Whiteoak Bayou or Buffalo Bayou. We believe Houston area bayous are an important environmental and quality-of-life amenity to the city and region. We support improved park facilities and greater access to all bayous in the Houston area, however, we believe that current and future public enjoyment of these resources consists and will consist of boating and bank activities and do not and will not include full-immersion swimming. We encourage the TCEQ to add "secondary contact recreation" to the state surface water quality standards framework, to develop a technically based criterion to protect the secondary contact use (based on the ratio of ingestion rates), and to develop a recreational use attainability analysis protocol. We urge the TCEQ to add language to the proposed TMDL that identifies the TMDL as provisional, explicitly notes the intent of the agency to assess the appropriateness of the use designations, to conduct use attainability analysis, and to modify the TMDL and the Water Quality management Plan if the use changes in the future.	No changes have been made based on this comment. The commenter correctly notes that TCEQ has funded and is developing methods for recreational UAAs. A use attainability analysis can be conducted at any time and the results can be submitted during the review of the Texas Surface Water Quality Standards. The Standards are reviewed approximately every three years for all parameters. Current proposals include a two-tier contact recreation use standard. Federal requirements do not allow adoption of a provisional TMDL or one that does not meet water quality standards.
004	7/1/08	Water Environment Association of Texas	**Make all Waste Load Allocations Non-Binding**. Individual waste load allocations for permitted wastewater treatment plants are presented in the report, however, the report states that these individual waste load allocations are "non-binding until implemented via a separate TPDES permitting action." This flexibility is welcomed and applauded; however, we believe that this type of flexibility is more necessary for permitted storm water discharges, since they have no control over volume, timing, and flow rate of their discharges or the bacteria concentrations in the discharges. Wastewater treat-	All allocations in the TMDL become part of the state's Water Quality Management Plan and serve as the guide for permitting actions. The storm water component of the waste load allocations is no more binding than the WWTF allocations. The TCEQ readily updates the Water Quality Management Plan. A statement, as requested, has been added to the waste load allocation section of the TMDL report.

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004 (cont.)			ment plants are significantly more consistent and are subject to direct operator control. We urge the TCEQ to include a similar statement in the discussion of the storm water waste load allocations.	
005	7/1/08	Water Environment Association of Texas	**Add Discussion of Implementation Approach for Permitted Storm Water**. WEAT believes that achieving significant reductions in indicator bacteria in permitted storm water discharges will pose a huge fiscal burden on the region and, based on current storm water best management practices (BMPs), may represent a huge engineering and technical challenge. See Clary, J., et. Al., 2008, "Can Stormwater BMPs Remove Bacteria?" *Stormwater Magazine*, May 2008, for an assessment of how well current storm water BMPs can remove bacteria. Do to these issues, WEAT urges the TCEQ to include a discussion of how storm water permits will be modified to address requirements. WEAT urges TCEQ to include provisions of EPA's *Questions and Answers Regarding Implementation of an Interim Permitting Approach for Water Quality-Based Effluent Limitations in Storm Water Permits* (Federal Register: November 6, 1996, Vol. 61, No. 216) and EPA Office of Water memorandum entitled: *Establishing TMDL WLAs for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs*, from Robert Wayland and James Hanlon to Water Division Directors, dated November 22, 2002.	No changes have been made based on this comment. The BIG and stakeholders will develop the strategy for managing permitted storm water sources in the Houston area. The current approach to the development of the BIG, the excellent resources available to develop the plan, and the experience and expertise of the organizations and individuals involved ensure the best plan for all stakeholders.
006	7/4/08	Linda D. Pechacek, P.E.	Numerous assumptions have been used as technical justification to generate the various loads provided in this TMDL document. However, there is no comprehensive TMDL supporting documentation or technical memorandum that identifies these assumptions. I am requesting that a technical memorandum be developed that identifies these assumptions that serve as the technical underpinnings of the load calculation and reduction process.	No changes have been made based on this comment. The supporting document is identified on page ii of the TMDL and is posted on the TCEQ Web site at: <www.tceq.state.tx.us/implementation/water/tmdl/22-buffalobayou.html> under the "Project

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006 (cont.)				Documents" section as "June 2008 – DRAFT TMDL Technical Support Document."
007	7/4/08	Linda D. Pechacek, P.E.	The use of the ratio of the two indicator bacteria standards (*E. coli* and Fecal Coliform) to transform almost 50 years of historical Fecal Coliform data to *E. coli* data. Where is the statistical documentation that supports the appropriateness of this wholesale data transformation? (p.33)	No changes have been made based on this comment. A transformation of 50 years of fecal coliform data was not necessary for the analyses conducted for this TMDL. In the instance cited by the commenter, the TCEQ used the ratio to compare the estimated biosolids loads to the loads from all other sources so that the concentrations could be expressed as *E. coli*. The ratio was not used on the historical, ambient water samples and a ratio was not used to develop the TMDL allocations.
008	7/4/08	Linda D. Pechacek, P.E.	The use of SSO flow volume estimates obtained from the 2004 EPA's Report to Congress were used to estimate the SSO flow volumes. It is noted that only City of Houston (COH) SSO data were examined for this load calculation. However, the permitted flows of these COH plants account for less than half of all of the permitted flows of the wastewater treatment facilities permitted in these TMDL watersheds (Table 11). The majority of the treatment facilities that were not evaluated for SSO flow volume data were Municipal Utility District facilities. Why were the MUD facilities not evaluated for SSO flow volume estimates? (p.39)	No changes have been made based on this comment. The City of Houston provided a comprehensive database of SSOs that was used as the basis of the SSO evaluation for the project. For areas outside the City of Houston (including MUDs), an SSO database was not available to the project team. Therefore, these areas were evaluated as described in the technical support document by "using a combination of SSO occurrence by age of pipe and housing age since SSO data were not available" (see page 65).
009	7/4/08	Linda D. Pechacek, P.E.	The land use types of the JTF EMCs did not match the HGAC land use types. Assumptions were made when assigning JTF EMCs to each HGAC land use type. In addition, Fecal Coliform data were transformed to *E. coli* data. (p.47)	No changes have been made based on this comment. The JTF Event Mean Concentrations collected fecal coliform for several different types of land

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009 (cont.)				uses. While the Event Mean Concentrations land use types did not match the exact land use classifications available for the Buffalo and Whiteoak Bayou watersheds, the EMCs were considered valuable site-specific data. See Comment 007 for the response regarding the conversion of fecal coliform to *E. coli* concentrations.
010	7/4/08	Linda D. Pechacek, P.E.	The direct deposition load calculation methodology for feral rock doves given the number of bridge crossings with a one-foot spacing between birds along the supports was used to calculate bird population density. The percentage contribution is assumed to be 50%, based on the assumption that birds nests and sleep 50%of the time away from the nest (p.58). Typically, nesting birds remain on the nest most of the time, not 50% of the time. Also, cliff swallows nest under the bridges too. The nests are not along the bridge supports; rather, the birds build mud nests under the bridge supports. However, my main concern regarding this particular assumption is that there was no discussion regarding birds roosting on wires that cross the waterways. Birds roost along the bridge supports at night and sit on the wires during the day. It is my experience that the number of feral rock doves sitting on wires that cross the waterway is much larger than the population roosting along the bridge supports at any given bridge crossing. I am incorporating by reference the photographs attached to my March 8, 2007 Bacteria TMDL stakeholder comments. Photograph numbers 15 and 16 show the doves roosting under the bridge supports at Loop 610 and White Oak Bayou. Photograph numbers 17 and 18 show the feral rock doves sitting on the wire adjacent to the Loop 610	No changes have been made based on this comment. Generally, there are insufficient data available to accurately estimate populations and spatial distribution by watershed of wildlife and avian species. Consequently, it is difficult to assess the magnitude of indicator bacteria contributions from wildlife species as a general category. The estimates provided in the TMDL are presented to generally determine if the loads from birds and wildlife are large enough to warrant attention during the development of the I-Plan. The estimates demonstrated that they should be considered in the I-Plan.

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010 (cont.)			bridge. Photograph numbers 19-21 show the bird droppings on the concrete slope paving under the wire where the feral rock doves in photographs 17 and 18 are sitting. Many more birds (350 or so) are on the wire than roosting under the bridge supports. The photographs of the bird droppings are near the top of the slope paving; but, the dropping extend all the way down the face of the slop paving to the water. The droppings are from direct deposition and the droppings just build up during dry weather conditions. The longer the antecedent dry period, the greater the build up. The bacteria from these bird droppings remain in place until they are washed off during a storm event. I have been collecting storm water samples for analysis for over 20 years. Based on my storm water sampling experience of collecting samples along slope paving similar to the droppings depicted in photographs 19 and 20, the *E. coli* bacterial concentrations from one sample can range as high as 90,000 CFU. The length of the paving to the water's edge coupled by the width of the paving under the bridge should be factored into the direct deposition loading calculation. I remain concerned that the current method described in the TMDL document does not come close to adequately estimating the dry weather deposition from the feral rock doves to the direct deposition bacteria load calculation. Presumably, the extremely high bacteria counts resulting from direct deposition mistakenly become attributed to wet weather flows from storm sewers.	
011	7/4/08	Linda D. Pechacek, P.E.	The sediment re-suspension load was calculated by multiplying the occurrence of re-suspension flows, sediment scour rates, and estimates of bayou width and stream lengths. The discussion of the calculation methodology is lacking clarity. In addition, the replication of the indicator bacteria in the sediment is not discussed or addressed adequately. The bac-	No changes have been made based on this comment. The survival and replication of bacteria in a natural water body are very difficult properties to determine. In studies conducted locally and nationwide,

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011 (cont.)			teria replication load calculation process needs to be discussed and the load needs to be appropriately estimated (p.60). In the EPA document "Report of the Experts Scientific Workshop on Critical Research Needs for the Development of New or Revised Recreational Water Quality Criteria (EPA 823-R-07-006), it is stated that replication of fecal indicator bacteria was reported in tropical areas and has now been documented in sub tropical areas such as south Florida and even temperate climates such as the Great lakes (p.37). On the same page, the document also states that fecal indicator bacteria can replicate in the environment, such as the soil, sediments, storm drains, or on plants or aquatic vegetative matter. These experts in the field of microbial water quality note that the principles of microbial ecology must be considered in water quality assessment, including environmental regrowth. They also suggest that temperature influences bacterial regrowth, something that the BLEST calculator tool may not be capable of addressing. I remain concerned that the regrowth load calculation in the TMDL document is not adequately estimated, and that the errors associated with estimating the load in this TMDL document is mistakenly attributed to storm water.	the results vary widely from increases in concentrations to reductions. The difficulty with all of these studies is that bacteria survival and replication characteristics in a natural water body are affected by a large and diverse set of conditions, such as predation, competition, sunlight, and other factors. There is no definitive answer to the survival and replication question. The TCEQ is funding research by the Texas A&M at Galveston Sea Food Safety and Marine Sciences Departments into the population dynamics of *E. coli* in the water bodies in the Houston area. Details are presented in the response to comment #29. The strategy used in the TMDL project is to assume that all of the factors controlling indicator bacteria fate and transport in the water bodies are balanced. As a result, the load capacity of the water bodies is not decreased due to survival and replication. The BLEST method and the HSPF model used the regrowth/die-off factor as a calibration parameter. For these two models, the calibration of the model resulted in a regrowth/die-off factor that was negative. The regrowth/die-off factor in these two models includes many elements other than the survival and replication of the bacteria in the environment.
012	7/4/08	Linda D. Pechacek, P.E.	Direct deposition loads are generally expected under dry or intermediate flow conditions since animals take shelter in inclement weather. Birds roosting under bridges are already sheltered from runoff conditions; therefore, the loading from feral rock doves roosting under bridges should also be in-	No changes have been made based on this comment. Under wet weather conditions, all material deposited on the ground is already accounted for in the

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012 (cont.)			cluded in the loading for wet weather flow conditions (p. 72).	runoff load. Adding more deposits from animals would be double-counting because under wet weather, the Event Mean Concentrations are used for all land uses over the entire area.
013	7/4/08	Linda D. Pechacek, P.E.	The load allocation from settling is negative (p. 73). The EPA document EPA 823-R-07-006 also notes that fecal indicator microbes are associated with settleable particulate matter. If the settleable sediment is not removed (dredged) from the waterway, then it remains a bacteria reservoir and should not be counted as a negative load value in the TMDL document.	No changes have been made based on this comment. BLEST includes a load associated with net die-off, settling, and other unaccounted-for processes. Therefore, the negative value includes more than just settling. The net processes load estimate is based on an average loss rate that was calculated from site-specific studies conducted for the project. While settling may be a reservoir for bacteria, the TMDL is ultimately developed for the overlying water and not for sediment. BLEST calculations account for loading from re-suspended sediment for those wet weather conditions when stream velocity increases, and this loading is positive.
014	7/4/08	Linda D. Pechacek, P.E.	The TMDL document uses an implicit margin of safety (p. 86). I remain concerned that the assumptions used in this document are not conservative in consideration of my comments provided above.	No changes have been made based on this comment. The implicit margin of safety is used because the loads were analyzed via three methods—the mass method (BLEST), load duration curves, and an HSPF watershed model. An implicit margin of safety is appropriate for TMDLs with this high degree of technical assessment and modeling.
015	7/4/08	Linda D. Pechacek, P.E.	The uncertainties in the TMDL document do not affect the ultimate conclusion that large load reductions are required to	No changes have been made based on this comment.

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015 (cont.)			achieve water quality standards (p. 95). I concur that large reductions are needed to improve the water quality of the listed stream segments. However, oversimplification or inadequate/incomplete parameter evaluation or variables related to fate and transport contributes to grossly inaccurate estimates for the loads of the various sources presently identified.	Any uncertainties in estimates of the indicator bacteria loads can be accommodated during implementation by adaptive management. Implementation activities can be adjusted based on their effectiveness and efficiency. The current approach to the development of the BIG, the excellent resources available to develop the plan, and the experience and expertise of the organizations and individuals involved ensures the best plan for all stakeholders.
016	7/4/08	Linda D. Pechacek, P.E.	The TMDL document and I-Plan should be modified to allow for change as new data and new advances in water quality/environmental science become available, and the TMDL load calculations and respective reductions of currently identified sources should be recalculated. Such recalculations will be necessary if new sources are added into the TMDL.	No changes have been made based on this comment. TMDLs are modified when new information shows that the allocations should be changed.
017	7/4/08	Linda D. Pechacek, P.E.	The reduction of the bacteria loads will require vast sums of capital expenditures, and it is important that the basis for making these expenditures be appropriate to achieve the results required under this regulatory program. It is also important that the final TMDL loads and allocations provide for a reasonable solution. The solution should be achievable and should not just set up the discharge permit holders in the listed stream segments for an inevitable downward spiral of terminal permit noncompliance.	No changes have been made based on this comment. The strategy for managing permitted storm water sources will be developed by the BIG and the stakeholders in the Houston area. The current approach to the development of the BIG, the excellent resources available to develop the plan, and the experience and expertise of the organizations and individuals involved ensures the best plan for all stakeholders.
018	7/3/08	Greater Houston Builders	**Re-evaluate TMDL end point**. TCEQ set the end point for the TMDL to be the geometric mean of 126 mpn/100ml for Buffalo Bayou and White Oak Bayou. The water quality	No changes have been made based on this comment.

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018 (cont.)		Association	standard allows for a single sample concentration to exceed 394 mp/100 ml no greater than 25% of the time. This equated to 7 samples out of 30 are allowed to be greater than 394 mpn/100ml as long as the geometric mean of all samples is 126 mpn/100ml or less. According to EPA, "some TMDLs focus on capturing the magnitude of the highest observed exceedance. However, such TMDLs may be overly protective of the water quality standard, potentially inviting issues regarding reasonable assurance. The objective of the TMDL is to estimate allowable pollutant loads and to allocate these loads to the known pollutant sources in the watershed so the appropriate control measures can be implemented and the WQS achieved." 40 CFR § 130.2 (I) states that TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measures. For fecal coliform, TMDLs are expressed as cfu (colony forming units) per day where possible or as% reductions, and represent the maximum one-day load the stream can assimilate while still attaining the WQS (EPA 2007).	In the water bodies covered by this TMDL, both the geometric mean and the single sample criteria are nearly always exceeded, often by very wide margins (see Table 5). The TCEQ surface water quality standards require attainment of both criteria. Setting the TMDL end point on only the single sample criterion will not assure that the geometric mean will be attained. The TCEQ reviews the surface water quality standards every three years for all parameters. It is TCEQ policy to review all completed TMDLs after each revision of the Standards and to revise TMDLs as necessary.
019	7/3/08 7/3/08	Greater Houston Builders Association Harris County Public Infrastructure Department	**Re-evaluate flow data and its use to establish the Buffalo Bayou portion of the TMDL**. Actual flow data at the mouth of non-tidal Buffalo Bayou is very limited. The majority of the data is for high flow events. To resolve this issue TCEQ developed a model to simulate the river flows. The model under predicts the peak flows, low flows and the falling limb of the hydrograph (pages 140- 146 of Technical Support Document for Buffalo and White Oak TMDL, May 2008). This weak calibration skews the flow duration curve. Page 86 of the document supports this statement "Although LDCs can be developed for all flow gauges in Buffalo Bayou, load reductions for segments 1013 and 1014 could not be determined because Addicks and Barker reservoirs exert influence on the flow regime…Thus these allocations may be unreliable. Therefore load reductions based upon the LDCs were	No changes have been made based on this comment. Data from the HSPF model were used to generate the low, intermediate, and high flow conditions. The model does not yield a perfect representation of the flow conditions in Buffalo Bayou. The calibration of the model, however, meets many of the metrics used to evaluate the model performance, including total volume and storm volume. There is a lack of flow data for Buffalo Bayou at the Shepherd gauge for all flow conditions (the gauge reports only high-flow data). Because of this condition, stakeholders directed the technical team

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019 (cont.)			only developed for the Whiteoak Bayou watershed..." Although the data was recognized as being questionable it was used to establish the flow categories of the BLEST mass-balance model which adds another layer of unreliability to the TMDL loads	to use the synthetic flow values from the HSPF model to estimate flows across the flow regime for the segment, based on their review of the November 2006 technical report prepared by the project team. The load allocations developed using BLEST are based on the best available data.
020	7/3/08	Greater Houston Builders Association	**Re-evaluate the linkage of non-point loading and receiving stream flow**. An independent analysis on Buffalo Bayou flows outside of the TMDL efforts was performed to examine the correlation between rainfall and flow data recorded by the above gages. Although there are some differences in the percent distribution of rainfall values in the different flow regimes, the differences are not significant. The rainfall distribution analysis revealed that many low and zero rainfall records are found to occur in high flow periods, while some remarkable rainfall events occurred in low to mid flow periods. It is also noted that many flow peaks occurred after one to several day lag of the rainfall spike. High flows may continue for an extended period after a rainfall spike. This data indicates that the assumption that storm water loads are directly linked to the instream flows of Buffalo Bayou is incorrect.	No changes have been made based on this comment. The commenter correctly notes that the water bodies in the project area do not respond immediately to rainfall in the watershed. This is especially true of rainfall that is in the distant parts of the watershed. Also, the effects of rainfall on the flow levels of the water bodies can be seen in the flow levels for five to seven days. In the Technical Support Document, the results of sampling during runoff events are presented. The data show that *E. coli* concentrations in the bayous rise with the rising limb of the hydrograph in response to the runoff. The bacteria concentrations rise to 2 to 3 orders of magnitude above the concentrations prior to the runoff. This demonstrates the response of the instream flow to storm water runoff events. The only known, significant sources of flow to the bayou are runoff and effluent discharges from WWTFs (notwithstanding the confounding effect of reservoir releases). Therefore, it is expected that the flow regime in the bayou (low flow and high flow as defined in the TMDL report) would respond to these two sources of water (effluent and runoff).

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021	7/3/08	Greater Houston Builders Association	Re-evaluate conservative assumptions: The TMDL document shows that there is no margin of safety within the TMDL equation. Although the margin of safety is not quantified, there are significant overly conservative assumptions that are part of the implicit margin of safety.	No changes have been made based on this comment. The TCEQ has used an implicit margin of safety because the loads were analyzed using three methods—the mass method (BLEST), the load duration curves, and an HSPF watershed model. An implicit margin of safety is appropriate for TMDLs with this high degree of technical assessment and modeling.
	7/3/08	Harris County Public Infrastructure Department	The typical types of MOS used in developing TMDLs include: <u>Explicit</u> Set numeric targets at more conservative levels than analytical results indicate Add a safety factor to pollutant loading estimates Do not allocate a part of available capacity, reserve for MOS <u>Implicit</u> Conservative assumptions in derivation of numeric targets Conservative assumptions when developing numeric model applications Some of the conservative assumptions (implicit MOS) applied to this TMDL include: 1) TMDL load calculated using the geometric mean as an end point not single sample, 2) Allocating WWTP effluent at one-half the instream bacteria concentration 3) Assuming WWTP discharge at design flow. 4) Allowing for additional bacteria load from the WWTP during rain events. 5) Holding back additional load for future WWTP growth. 6) Limiting the load to a three step flow scenario which in turn leaves additional capacity unavailable for use.	1. See response #18 2. The load allocations for WWTF dischargers is necessary and realistic to allow capacity for current bacteria loads, including storm water, down stream, especially in Buffalo Bayou Tidal. 3. In order to approve the TMDL, the EPA requires separate waste load allocations for WWTFs. TCEQ is also required to break out the WLA into continuous (WWTF) and non-continuous (storm water) loads. The TCEQ readily takes actions to revise the WLA components of the TMDL in order to de-

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021 (cont.)				velop permits consistent with the TMDL. Water Quality Management Plan updates are minor changes to TMDLs to accommodate the re-allocation between individual permits and are processed by the TCEQ Executive Director approximately quarterly. 4. Additional WWTF loads for rain events are not part of the TMDL allocations. 5. Additional loads are not reserved for future WWTF dischargers. The future capacity is derived from the additional flow from new WWTF dischargers. The additional flow carries a load of one-half of the contact recreation criteria time the flow. This provides additional capacity of one-half of the criteria times the flow. This additional capacity is allocated to storm water runoff. 6. The use of the three flow divisions does not leave additional capacity for bacteria loads. The entire capacity at high flow is used in the allocations.
022	7/3/08	Greater Houston Builders Association	**Remove specific waste load allocations from the TMDL**. All TMDLs require allocation of a portion of the load to WLA and the other to LA. Since WWTP and MS4 loads fall under the WLA portion of the equation we recommend leaving the division between the various TPDES permit holders (WWTP and MS4) to the implementation portion of the TMDL. The Clean Water Act allows for some flexibility when writing individual permits but the inclusion of loads limits this flexibility.	No changes have been made based on this comment. In order to approve the TMDL, the EPA requires separate waste load allocations for WWTFs. TCEQ is also required to break out the WLA into continuous (WWTF) and non-continuous (storm water) loads. The TCEQ readily takes actions to revise the WLA components of the TMDL in order to develop permits consistent with the TMDL. Water Quality

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022 (cont.)			The permitted storm water discharges need flexibility as well. One option available to the regulated community for meeting the TMDL limits is loads allocation trading. EPA has written many papers about water quality trading where there have been discussions about point source trading. Data collected during the development of this TMDL show that some of the larger WWTP perform well with the removal of bacteria and others do not. In addition to trading between plants there is the potential to shift the allocation towards the MS4 permit where loads are managed with BMPs such as outreach and may not be able to meet the restrictive load identified in the TMDL. We strongly urge the TCEQ to remove specific waste load allocations and evaluate the possibility of load allocation trading during the implementation of this TMDL.	Management Plan updates are minor changes to TMDLs to accommodate the re-allocation between individual permits and are processed by the TCEQ Executive Director approximately quarterly. Trading can occur between a variety of loading sources. The TCEQ encourages the exploration of this concept during implementation discussions.
023	7/3/08	Greater Houston Builders Association	**Add analysis of concentrations vs. flow prior to adoption of the TMDL**. A preliminary analysis of bacteria concentrations and their associated bayou flow rates indicates that during dry weather, when recreational activities such as boating would be more likely, bacteria levels range from 1,000 to 3,000 colonies per 100 milliliter at most monitored stations. During wet weather conditions, bacteria levels can reach 100,000 colonies per 100 milliliter due to the contributions from wet-weather sources. This suggests that during dry weather, indicator bacteria levels are safe for boating (assuming that boating ingestion rates are 100 times less than swimming ingestion rates) and during wet weather, when recreational activities would not be occurring, bacteria levels are temporarily elevated, but public exposure is minimized. To explore this issue more thoroughly, HCEC suggests that the TCEQ plot bacteria concentrations vs. the associated bayou flow rate (on the day of sample collection) to assess the differences in standards attainment during wet and dry	No changes have been made based on this comment. The load duration curves in the "Load Duration Curve Results" section of the TMDL present the indicator bacteria loads plotted versus flow rates for three locations in the Reservoirs watershed, two locations in the Buffalo Bayou Above Tidal watershed, and one location in the Whiteoak Bayou watershed. Although these are not concentrations, the bacteria levels for high and low flows relative to the contact recreation criterion can be observed. Should the Bacteria Implementation Group decide that concentration versus flow analysis is helpful, the analysis can be performed. The current water quality standards for contact recreation do not distinguish between degrees of immersion and the difference in those human health risks. Current proposed changes to the water

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023 (cont.)			weather conditions. This analysis will assist the TCEQ and stakeholders with assigning appropriate load reductions for both dry and wet weather sources.	quality standards are attempting to address those concerns.
024	7/3/08	Greater Houston Builders Association	**Add discussion of implementation approach for permitted storm water**. HCEC believes that achieving significant reductions in indicator bacteria in permitted storm water discharges will pose a huge fiscal burden on the region and, based on current storm water best management practices (BMPs), may represent a huge engineering and technical challenge. See Clary, J., et. al., 2008. "Can Stormwater BMPs Remove Bacteria?" *Stormwater Magazine,* May 2008, for an assessment of how well current storm water BMPs can remove bacteria. Due to these issues, HCEC urges the TCEQ to include a discussion of how storm water permits will be modified to address TMDL requirements. HCEC urges TCEQ to include provisions of EPA's *Questions and Answers Regarding Implementation of an Interim Permitting Approach for Water Quality-Based Effluent Limitations in Storm Water Permits* (Federal Register: November 6, 1996, Vol. 61, No. 216) and the EPA Office of Water memorandum entitled: *Establishing TMDL WLAs for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs*, from Robert Wayland and James Hanlon to Water Division Directors, dated November 22, 2002.	All allocations in the TMDL become part of the state's Water Quality Management Plan and serve as the guide for permitting actions. The storm water component of the waste load allocations is no more binding than the WWTF allocations. As described in a previous response, the TCEQ readily updates the water quality management plan. A statement, as requested, has been added to the waste load allocation section of the TMDL report.
025	7/3/08	Harris County Public Infrastructure Department	The specified end point listed on page 4 of the briefing outline does not match the discussion of appropriate endpoint as defined in 40 CFR §139.2(1) on page 5 of the same. The endpoint specified in this TMDL report is the geomean criterion of 126 mpn/dL. However, 40 CFR §139.2(1) states that a TMDL represents the maximum one day load; therefore this TMDL should make use of the single sample maximum, which, according Texas surface water quality standards, is 394 mpn/dL. Using the geometric mean as the end point is	No changes have been made based on this comment. Indicator bacteria concentrations must be less than the single sample criterion of 394 MPN/100mL for 75% of the time to ensure that the geometric mean is 126 MPN/100mL or less. If the TMDL target is set at 394 MPN/100mL for all time periods, then the 126 MPN/100mL will not be met. If the 126

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025 (cont.)			overly-conservative. The daily maximum of 394 mpn/dL should be used instead.	MPN/100mL geometric mean standard is used, the 394 MPN/100mL can be exceeded 25% of the time. The use of the geometric mean is the appropriate target to attain the contact recreation use. It should be noted that in Fact Sheet #2 *WQS For Coastal Recreation Waters*, the EPA identifies a geometric mean as a more appropriate endpoint. "Other than in the beach notification and closure decision context, the geometric mean is the more relevant value for ensuring that appropriate actions are taken to protect and improve water quality. The geometric mean is generally more relevant because it is usually a more reliable measure of long term water quality, being less subject to random variation, and more directly linked to the underlying studies upon which the 1986 bacteria criteria were based."
026	7/3/08	Harris County Public Infrastructure Department	According to the TMDL report TCEQ appears to have selected a percentage of the geometric mean of 126 mpn/dL as the endpoint. The actual value used to calculate the TMDL load may be different for White Oak Bayou than Buffalo Bayou as the document does not clearly state the end point number for White Oak Bayou, but load duration curve discussion states that 197mpn/dL was used. Using a fraction of the geometric mean as the end point is overly-conservative. The daily maximum of 394 mpn/l00ml should be used instead.	No changes have been made based on this comment. The TMDL targets for all water bodies presented in the allocation tables are based on the geometric mean criterion of 126 MPN/100mL. To analyze the WWTF contribution to the Load Duration Curve analysis, one half of the permitted single sample value was used for all water bodies. The 197 MPN/100mL value for WWTF discharges is the same as one-half of the geometric mean standard which was used to determine the load allocations for WWTFs.

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027	7/3/08	Harris County Public Infrastructure Department	On page 87 of the TMDL report, there is a contradiction regarding the endpoint. The existing load was calculated as the median value of the observed loads plotted on the load duration curve for each flow regime of interest, while the TMDL was the median of the single sample water quality standard load for each flow condition. The TMDL load tables omitted critical information which made back calculating the loads nearly impossible to verify or determine which end point value was used. Harris County requests clarification and resolution of this issue.	A description of the TMDL load allocation tables has been added to the report in the "Assessment Unit TMDL Allocations" section and in the "Watershed TMDL Allocations" section. The single sample value cited on page 87 of the TMDL report refers to the value used to represent the WWTF contribution in the load duration curve analysis. This analysis was used to determine the load reductions and not the TMDL load allocations.
028	7/3/08	Harris County Public Infrastructure Department	The 2007 EPA documents, *Approach for Using Load Duration Curves* and *Options for Expressing Daily Loads in TMDLs* state that TMDLs are to represent the maximum one day load a stream can assimilate while still maintaining the water quality standard. The proposed use of the geometric mean to identify the allowable load for the Bacteria TMDL for Buffalo and White Oak Bayous is counter to the approach described in these two documents. The daily maximum of 394 mpn/100ml should be used instead.	No changes have been made based on this comment. Indicator bacteria concentrations must be less than the single sample criterion of 394 MPN/100mL for 75% of the time to ensure that the geometric mean is 126 MPN/100mL or less. If the TMDL target is set at 394 MPN/100mL for all time periods, then the 126 MPN/100mL will not be met. If the 126 MPN/100mL geometric mean standard is used, the 394MPN/100mL can be exceeded 25% of the time. The use of the geometric mean is the appropriate target to achieve the contact recreation standard. It should be noted that TMDL guidelines from the EPA identify a geometric mean as a more appropriate endpoint. See response #25 for further explanation.
029	7/3/08	Harris County Public Infrastructure Department	Limited understanding of bacteria dynamics within Texas Bayous: Scientifically supportable identification of the sources of bacteria and the link: between sources and in-stream levels continues to be a problem with the TMDL	No changes have been made based on this comment. The survival and replication of bacteria in a natural

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029 (cont.)			study to date. Local studies point to the potential for naturalized *E. coli* colonies growing within the sediments of our Bayous. The dynamics of bacteria once in the stream include a nonlinear relationship between the *E. coli* and Fecal Coliform bacteria. The true impact of naturalized bacteria on the standard as it relates to human health risks needs to be evaluated. Without establishing the link between sources and in-stream effects as well as identifying the site specific relationship between the *E. coli* and Fecal Coliform bacteria, true calibration of any model used is not feasible. Without a more accurate identification of the sources and dynamics, calculations and estimates of pollutant loads remains theoretical and the path for actually improving the water quality in the waterways remains unclear.	water body are very difficult properties to determine. In studies conducted locally and nationwide, the results vary widely from increases in concentrations to reductions. The difficulty with all of these studies is that bacteria survival and replication characteristics in a natural water body are affected by a large and diverse set of conditions, such as predation, competition, sunlight, and other factors. There is no definitive answer to the survival and replication question. The TCEQ is funding population dynamics research by the Texas A&M at Galveston Sea Food Safety and Marine Sciences Departments into the dynamics of *E. coli* in the water bodies in the Houston area. The research is directed towards answering the following questions: 1. Can *E. coli* and *Enterococcus* spp. bacteria survive for extended periods in the natural waters and sediment in Buffalo Bayou and Whiteoak Bayou and in the soils in the watersheds? 2. Can *E. coli* and *Enterococcus* spp. bacteria replicate (grow) in natural waters and soils in Buffalo Bayou and Whiteoak Bayou? 3. If these bacteria are found to replicate in natural waters and soils, what are they using for growth substrates? In other words, are they utilizing WWTF effluent-derived substrates or other substrates found in the waters and soils? 4. How does storm water runoff influence survival and growth of these bacteria? Are these bacteria attached to particulate matter in the watersheds or surviving on biofilms in dis-

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029 (cont.)				charge conveyance systems and are then flushed into bayous during rain events? The strategy used in the TMDL project is to assume that all of the factors controlling indicator bacteria fate and transport in the water bodies are balanced. As a result, the load capacity of the water bodies is not decreased due to survival and replication. The BLEST method and the HSPF model used the regrowth/die-off factor as a calibration parameter. For these two models, the calibration of the model resulted in a regrowth/die-off factor that is negative. The regrowth/die-off factor in these two models includes many elements other than the survival and replication of the bacteria in the environment.
030	7/3/08	Harris County Public Infrastructure Department	**Subjectivity and inconsistencies in modeling application**. Three modeling approaches were used to evaluate the bacteria loads and to define the TMDL; i) a watershed model, HSPF, ii) load duration curve and iii) a mass balance model, BLEST. The flow used in all three models was the same and produced by the HSPF model. According to the TMDL document, the predicted loads from the first two models were not used because of model calibration problems or limited flow data. The BLEST model, which multiplies flow and concentration to calculate a load, used the flow from HSPF model. Accepting the use of a flow data set in one model and rejecting the same data set for use in another when the degree of complexity of the models is the same with out clear justification is subjective and arbitrary.	No changes have been made based on this comment. The BLEST mass balance method, using the flow calculated from the HSPF model, was used to determine the TMDL target load. The load duration curve method was not used because there is limited flow-gauge data, and all of the gauge data for Buffalo Bayou, both above and below tidal, are influenced by the operation of the Barker and Addicks flood control dam. The load duration curve method, the BLEST mass balance method, and the HSPF model were each used to determine the% reductions. The results of each analysis were compared to demonstrate that they are consistent. None of these models were used to calculate the allocations. The allocations

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030 (cont.)				are based only on the flows that are the basis for each method and not on the output of any of the analysis methods.
031	7/3/08	Harris County Public Infrastructure Department	Assuming the bacteria loads from the reservoirs meet the standard is inappropriate since a good deal of wildlife and livestock graze there. Empirical evidence is needed to support this assertion	No changes have been made based on this comment. The Reservoir watershed and the bacteria-impaired water bodies within the watershed have TMDL allocations. The TMDL allocations are set to meet the water quality standards, so the target for the water flowing from the watershed is also set to meet the criteria for *E. coli*. The TCEQ agrees that the effort necessary to reach this target will be challenging. We agree that there will be a need to further assess all significant sources and the potential for progress. This will be addressed in the I-Plan developed by the stakeholders.
032	7/3/08	Harris County Public Infrastructure Department	The fecal coliform concentrations measured in biosolid discharges range from a low of 90 to as great as 153,000 cfu/dL. Applying the assumptions that 1) all biosolid discharges have an average concentration of 4,143 of fecal coliform, 2) converting fecal coliform to *E. coli* using the default conversion factor, and 3) assuming there are biosolid discharges throughout the region is overly-conservative. Harris County requests that these assumptions be refined through empirical evidence and investigation.	No changes have been made based on this comment. The estimate of biosolid releases was based on the best available data and expanded at the request of the stakeholders. The estimate shows that biosolids releases are probably a significant source of indicator bacteria to the water bodies. This helps the stakeholders prioritize their efforts during the development of the I-Plan. The biosolids release estimates can be further refined during implementation, based on the needs of the stakeholders.
033	7/3/08	Harris County Public Infrastructure	The TMDL report on page 46 describes how the dry weather regulated storm water discharges were calculated. "(T)these total flows ...were multiplied by 365 to get a yearly flow and	No changes have been made based on this comment.

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033 (cont.)		Department	then divided by 291 ....to ensure dry weather discharges were only counted on dry days in MGD." The flows were initially reported in MGD and dry days are handled separately, so no additional conversions were necessary. Therefore, Harris County requests that the additional conversions be eliminated from the model.	The dry-weather flows should not be occurring from the storm sewer system. However, they do occur, and they occur daily. Thus, the annual load would be the measured flow rates multiplied by the total number of days in the year. However, in order to account for the load, but not double-count storm sewer discharges on rainy days, the load was distributed among the 291 non-rainy days.
034	7/3/08	Harris County Public Infrastructure Department	On page 60, the author describes the method for accounting bacteria input from dogs. "According to the American Veterinary Medicine Association there are approximately 0.58 dogs per household." The TMDL reported the dog density as 0.53 dogs per acre but noted that some of the area as not suitable for recreation so the density was adjusted to 0.41 dogs per acre. The dog density should increase since there is less usable land. These errors may not have a big impact on available loads but bring into question the reliability of other data that was manipulated.	No changes have been made based on this comment. The estimate of indicator bacteria input from dogs was based on the best available data and expanded at the request of the stakeholders. The estimate, conducted as a part of the source assessment, shows that bacteria from dog feces are probably a source of indicator bacteria in the water bodies. The estimate helps the stakeholders prioritize their efforts during the development of the I-Plan. The estimate of the input from dogs can be further refined during implementation, based on the needs of the stakeholders. The estimate was not used to calculate the TMDL allocations.
035	7/3/08	Harris County Public Infrastructure Department	The methods for assigning loads to the various sources are inconsistent and often include loads that are illicit or permit violations. When determining the dry weather loads for wastewater treatment facilities (WWTFs), the self reported flow and bacteria counts were used. Many of the WWTFs were assigned a value of 6.14, which appears to be a default value, although the justification is unclear. Other WWTFs were having performance issues during the sampling period and their baseline concentrations were assumed to be very high. Biosolid discharges, plant upsets, plant maintenance,	No changes have been made based on this comment. The commenter is correct that the existing conditions were estimated to include pollutant loading from sources that are not allowable. However, the TMDLs do not include allocations for sources that are not permitted. The purpose of estimating loads for all sources, including those that are not authorized, is to esti-

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035 (cont.)			and sanitary sewer overflows (SSOs) were assigned a load, although since these represent violations they should not be assigned allocations.	mate whether the source is contributing to the high concentrations of indicator bacteria in the water bodies. This helps the stakeholders prioritize their efforts during the development of the I-Plan. Monitoring information was not available from 39 of the 126 WWTFs. The 6.14 value represents the geometric mean of the *E. coli* concentrations measured from all WWTFs in the Buffalo Bayou watershed. This value was assigned to the WWTFs for which monitoring data was not available as an estimate of the discharge concentrations.
036	7/3/08	Harris County Public Infrastructure Department	On page 88, the endpoint is identified as the geometric mean concentration of 126 cfu/dL. It is difficult to reproduce the TMDL endpoints. TCEQ used the sum of the BLEST target load and the calculated load representing the difference between actual flow and permitted flow to identify the TMDL endpoint for each segment. The calculations are complex and not clearly identified. Harris County requests the TCEQ clearly identify assumptions used for model calculations.	A description of the TMDL load allocation tables has been added to the report in the "Assessment Unit TMDL Allocations" section and in the "Watershed TMDL Allocations" section.
037	7/3/08	Harris County Public Infrastructure Department	Discharge List: The list of TPDES dischargers is incomplete. If the list is to be included in the TMDL please make sure it is complete.	The list of dischargers has been updated to correct the permitted flows. The list of TPDES dischargers is correct through 2006. This is the time period for the sampling and analysis of the bacteria loads. The modeling that was conducted was for the conditions in the watershed from 2001 through 2006. The load duration curve method, the BLEST mass balance method, and the HSPF modeling were all conducted for the conditions in the watershed during this time period. The list of WWTF dischargers represents the facilities contributing to the indicator bacteria con-

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037 (cont.)				centrations that were measured in the water bodies during this time period. The future capacity allocation will accommodate the WWTF discharges that have be added and removed since the 2006 time period.
038	7/3/08	Harris County Public Infrastructure Department	Future capacity is held in reserve for WWTFs but not for Municipal Separate Storm Sewer Systems (MS4s). Please explain the difference in approach.	No changes have been made based on this comment. Additional dischargers represent additional flow that is not accounted for in the current allocations. Changes in MS4 jurisdiction or additional development associated with population increases in the watershed can be accommodated by shifting allotments between the waste load allocation and the load allocation. This can be done without the need to reserve future capacity waste load allocations for storm water. In un-urbanized areas, growth can be accommodated by shifting loads between the load allocation and the waste load allocation (for storm water). In urbanized areas currently regulated covered by an MS4 permit, development and/or re-development of land in urbanized areas must implement the control measures/programs outlined in an approved Storm Water Pollution Prevention Plan (SWPPP). Although additional flow may occur from development or re-development, loading of the pollutant of concern should be controlled and/or reduced through the implementation of best management practices (BMPs) as specified in both the NPDES permit and the SWPPP. Currently, it is envisioned that an iterative adaptive management BMP approach be used to address storm water discharges. This ap-

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				proach encourages the implementation of controls (i.e. structural or non-structural), implementation of mechanisms to evaluate the performance of the controls, and finally allowance to make adjustments (i.e., more stringent controls or specific BMPs) as necessary to protect water quality.
039 039 (cont.)	7/3/08	Harris County Public Infrastructure Department	When calibrating a model, all sources must be considered. In this case, a load that includes the frequent WWTP permit violations should be included for the model calibration. However, the load describing permit violations should not be part of the "base line" load nor should it be used in determining% reduction. These discharges are not allowable under the TPDES program and should not be part of the TMDL equation. WWTP upsets and SSOs are compliance issues that TCEQ should be addressing through the TPDES permit program	No changes have been made based on this comment. Models are calibrated to observed conditions. Observed conditions include all sources, including unauthorized sources and violations. Any unauthorized sources must be reduced to zero because they are violations of existing regulations; these reductions are part of the overall reduction goal. Unauthorized discharges are actively contributing to the water quality impairment, and should therefore be included in any load reduction evaluation. These loads are not part of the TMDL allocations.
040	7/3/08	Harris County Public Infrastructure Department	The basis for the 90%/10% split is not clearly defined. Allocating 90% of the load to WLA may appear to be fair at first look. The WLA load is broken down between WWTP and MS4, with a respective ratio of 90% to 10%. In other words, the WWTFs are allowed to contribute the lion's share of bacteria loading (90% of overall 90%). Yet, contrary to MS4s, WWTFs are in the position of being able to fully capture and intensively treat contributing flows. Paradoxically, the discharges that are most difficult to control (MS4) have the most restrictive load. Harris County requests the TCEQ clearly define the rationale for the splitting the load allocation between WWTFs and MS4s.	No changes have been made based on this comment. The WWTF load allocations were determined by using the permitted flow times 63 MPN/100mL, one-half of the contact recreation criterion. The bacteria loads remaining after the allocations for the WWTFs, the upstream loads, and the future capacity for WWTFs are subtracted from the load capacity (TMDL) and then divided into 90% for the WLA for storm water and 10% for the LA. The assignment of 90% of the available load to

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				permitted storm water sources (WLA storm water) and 10% to unpermitted storm water (LA) was based on an assessment of the relative magnitude of each source. Stakeholders can request adjustment of this ratio during development of the I-Plan if information demonstrating a better strategy for dividing the available allocations is developed or provided.
041 041 (cont.)	7/3/08	Harris County Public Infrastructure Department	Since WWTP and MS4 loads fall under the WLA portion of the equation, Harris County recommends leaving the division between the various Texas Pollutant Discharge Elimination System (TPDES) permit holders -*i.e.* WWTP and MS4 - to the implementation portion of the TMDL. EPA has written many papers about water quality trading credits between point sources. With water quality trading credits, well-performing WWTFs could sell credits to poor-performing WWTFs, and even to MS4s, the latter of which manage discharges using Best Management Practices (BMPs) and which have little hope of meeting the restrictive load identified in these TMDLs.	No changes have been made based on this comment. Currently, the EPA requires separate waste load allocations for all individual waste water treatment facilities (WWTFs) and an individual allocation for all storm water permits (MS4, industrial, and construction). This TMDL is only establishing an aggregate WLA value for storm water in the TMDL. Further discrimination should be done by the stakeholders. The TCEQ readily takes actions to revise the WLA components of the TMDL in order to develop permits consistent with the TMDL. Water Quality Management Plan updates are minor changes to TMDLs to accommodate the re-allocation between individual permits and are processed by the executive director approximately quarterly.
042	7/3/08	Harris County Public Infrastructure Department	According to the discussion on page 22, the TMDL was "evaluated under three different flow scenarios based upon the flow duration curve." Dry conditions represent less than 30^{th} percentile, intermediate flow is 30^{th} to 70^{th} percentiles, and wet conditions are greater than 70^{th} percentile. The corresponding flows for these conditions are not identified	No changes have been made based on this comment. Flow duration curves demonstrating these conditions are presented in Figure 2 in the "Technical Support Document" (June 2008) posted on the

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			within the TMDL document. Omitting this important information makes detailed review of the TMDL and compliance nearly impossible.	TCEQ Web site at: <www.tceq.state.tx.us/implementation/water/tmdl/22-buffalobayou.html> under the "Project Documents" section.
043 043 (cont.)	7/3/08	Harris County Public Infrastructure Department	**Inconsistencies between this Bacteria TMDL and Others**. Harris County has noted major inconsistencies between this TMDL and Clear Creek and other bacteria TMDLs throughout the state, and requests that the TCEQ develop a consistent approach. Such inconsistencies include: • Different endpoints for different subwatersheds for the Buffalo Bayou/White Oak Bayou Watershed • The Upper Gulf Coast Oyster Water Bacteria TMDL was concentration based using the median bacteria concentration. • Clear Creek Bacteria TMDL was concentration-based in the non-tidal portion while it was load-based in the tidal portion using the geomean. • Gilleland Creek Bacteria TMDL endpoint was load-based using both single sample and geomean values.	No changes have been made based on this comment. The approach used to develop a TMDL is based on the available data, the magnitude of the problem, conditions within the watershed, and stakeholder input. The mass balance method (BLEST), the load duration curve method, and the HSPF watershed model were used because of the extremely high indicator bacteria concentrations in the water bodies and the very complex loading conditions in the highly urbanized watershed. The end points for all of the water bodies in the Buffalo and Whiteoak Bacteria TMDL are the same—126 MPN/100mL, which is the geometric mean contact recreation standard. The Clear Creek Bacteria TMDL uses a load-based end point of 120 MPN/100mL (5% MOS) for all water bodies. The Gilleland Creek Bacteria TMDL uses the end point of 120 MPN/100mL (5% MOS) for all water bodies. The Upper Gulf Coast Oyster Water Bacteria TMDL uses a completely different end point because the TMDL is addressing the oyster waters standard and not the contact recreation standard.
044	7/3/08	Harris County Public Infrastructure Department	Implementation Flexibility Hindrances: All TMDLs need to allocate a portion of the load to Wasteload Allocation (WLA) and the other to Load Allocation (LA). Since WWTP and MS4 loads fall under the WLA portion of the	No changes have been made based on this comment. In order to approve the TMDL, the EPA requires

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			equation, Harris County recommends leaving the division between the various Texas Pollutant Discharge Elimination System (TPDES) permit holders—i.e., WWTP and MS4—to the implementation portion of the TMDL. EPA has written many papers about water quality trading credits between point sources. Data collected during the development of this TMDL show that some of the larger WWTFs perform well in removing bacteria while others do not. In such cases, credits could be traded between well-and poorly-performing WWTFs. Likewise, under this approach credits could be traded between WWTFs and MS4s, the latter of which manage discharges using Best Management Practices (BMPs) and which may not be able to meet the restrictive load identified in these TMDLs.	separate waste load allocations for WWTFs. The TCEQ is also required to break out the WLA into continuous (WWTF) and non-continuous (storm water) loads. The TCEQ readily takes actions to revise the WLA components of the TMDL in order to develop permits consistent with the TMDL. Water Quality Management Plan updates are minor changes to TMDLs to accommodate the re-allocation between individual permits and are processed by the TCEQ Executive Director approximately quarterly. Trading can occur between a variety of loading sources. The TCEQ encourages the exploration of this concept during implementation discussions.
045 045 (cont.)	7/3/08	Harris County Public Infrastructure Department	l) Establish the TMDL as a concentration-based TMDL similar to the Upper Coast Oyster Waters Bacteria TMDL. Federal regulations allow for the establishment of a concentration based TMDL for a pollutant that is not readily controllable on a mass basis; or 2) Follow the guidance in the United States Environmental Protection Agency's (EPA's) 2007 documents, *Approach for Using Load Duration Curves* and *Options for Expressing Daily Loads in TMDLs*, by establishing the "90% of the daily maximum concentration" as the endpoint and increase the number of flow categories to five.	No changes have been made based on this comment. 1. The approach used to develop a TMDL is based on the available data, the magnitude of the problem, conditions within the watershed, and stakeholder input. The load allocation TMDL is appropriate for this watershed. The concentration-based TMDL was used in the Upper Coast Oyster Waters Bacteria TMDL because of the very low bacteria concentrations and the localized nature of the exceedances. 2. The water quality standards include provisions for single-sample and geometric-mean criteria in support of recreational uses, both of which need to be met in order to conclude that the water body is attaining uses. Application of the 90th

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045 (cont.)				percentile as the end point (Texas allows for a 75th percentile) does not ensure compliance with a geometric mean and would thus not be protective. The use of the geometric mean end point provides additional certainty that all criteria will be met, even at a 75th percentile. As an example, the following hypothetical *E. coli* sample set meets the 90th percentile but would exceed the geometric mean (150 cfu, 180 cfu, 220 cfu, 290 cfu, 300 cfu, 310 cfu, 315 cfu, 350 cfu, 375cfu, 380 cfu). An analysis was done using the 75th percentile rather than the 90th. It found that the single-sample TMDLs were less restrictive, and in most cases, the 75th percentile did not result in attainment of the geometric mean criterion. If the 90th percentile of the concentrations were to be used, exceedances of the geometric mean criterion would be even higher. The three flow categories used in the TMDL indicate the conditions that are influenced by storm water runoff and WWTF discharges. High flow (wet conditions) are influenced predominately by storm water runoff and low flow (dry conditions) are influenced by predominately WWTF discharges. Intermediate flow is a mixture of the two dominant sources. Five categories would not improve this general analysis.
046	7/3/08	City of Houston	The City of Houston looks forward to its continued work with the Texas Commission on Environmental Quality (TCEQ) and its MS4 co-permittees on the Storm Water Quality Joint Task Force (JTF) to address the health of our waterways and bayous, while also addressing the very real flooding problems that exist within the City of Houston.	No changes have been made based on this comment.

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			The City generally agrees with many of the comments that you will receive regarding the lack of sufficient scientific data and resulting application of inappropriate water quality standards for these water bodies. However, the City also acknowledges the constraints placed on TCEQ due to the date that these segments were included on the 303(d) list. Therefore, we support moving into the implementation phase so that local stakeholders will become engaged in developing methods to improve our waterways. The City has demonstrated its commitment by renewing the infrastructure of our wastewater collection system, strengthening and enforcing local stormwater regulations related to discharges that occur during construction, and increasing efforts to eliminate other illicit discharges. The City alone cannot accomplish the task of improving the bayous. It will take a significant effort by many stakeholders in this region to implement activities that provide meaningful reduction of bacteria, particularly from human sources, in our waterways.	
047	6/6/08	Bayou Preservation Association	First while the report lists the obvious sources of bacteria such as wastewater treatment plants, septic tanks, sanitary sewer overflows, etc. it does not quantify as to how much each source is contributing to the water quality problem. Sediment is also shown to be statistically significant contributor to water quality but by how much? The correlation between ammonia and total organic carbon and bacteria levels is noted, but how will this information be used to meet water quality standards?	No changes have been made based on this comment. The load allocations described in the TMDL provide goals for developing the I-Plan and strategies to control all sources. Indicator bacteria in the sediment can contribute to the bacteria concentration in the water under high flow conditions. The estimated loads are presented in the BLEST mass balance tables (Tables 25, 26, 27, & 28). Sediment resuspension indicator bacteria loads are not external loads and they are not subject to load

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				limits. The indicator bacteria in sediment contribute to the instream conditions that determine the assimilative capacity of the water bodies. Because all of the identified sources contribute loads to the sediment by decreasing all of these loads, the indicator bacteria load for the sediments will also decrease. No correlations between ammonia or total organic carbon and indicator bacteria have been established.
048	6/6/08	Bayou Preservation Association	Second, the report does not discuss the amount of reductions that would be required from each source. So how is an I-Plan going to be put together?	No changes have been made based on this comment. The load allocations described in the TMDL provide goals for developing the I-Plan and strategies to control all sources.
049	7/3/08	Houston Council of Engineering Companies	Add Provisions to Reopen TMDL if Water Quality Standard is Altered: The proposed TMDL is based on an inapplicable standard. The current water quality standard for contact recreation is based on studies of temperate, fresh water lake; however, it has been inappropriately applied to subtropical creeks, streams, and bayous. The current standard is based on 9 experimental trials measuring lake bacteria levels, swimmer illness rates, and non-swimmer illness rates conducted in Oklahoma (Keystone Lake) and Pennsylvania (Lake Erie) with different climate and aquatic conditions than those found in the Houston region. Seven of the 9 trials did not show a statistically significant difference in illness rates between swimmers and non-swimmers, yet these nine trials were used by EPA to derive	The TCEQ must develop TMDLs for the water quality standards currently approved. We agree that the standards should be reviewed. The water quality targets are reviewed approximately every three years for all parameters. There is an ongoing stakeholder advisory group participating with TCEQ on considering revisions to recreational use categories and numerical criteria. It is TCEQ policy to review all completed TMDLs after each revision of the Texas Surface Water Quality Standards and to revise TMDLs as necessary.

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			the existing nationally applied criterion. The 9 trials revealed a moderate correlation between *E. coli* levels in the water and illness rates (0.72); however, the correlation between swimmer and non-swimmer illness rates was similar (0.67), suggesting that illness transmission could have occurred via routes other than from water exposure. This and other published criticisms of the EPA fresh water criteria (Haas, 2006) suggest that Texas and regional stakeholders should conduct research into this area to improve the technical basis for our contact recreational water quality standards. HCEC urges the TCEQ to modify the content of the "Implementation and Reasonable Assurances" section to include mention of future research activities and the TCEQ's intent to modify the TMDL and the Water Quality Management Plan if a new water quality standard is developed and adopted as a result of future research.	The "Implementation and Reasonable Assurances" section of the TMDL report was modified as requested to mention how implementation can be adjusted based on standards changes.
050	7/3/08	Houston Council of Engineering Companies	Use General Waste Load Allocation for All Point Sources: All TMDLs require a determination of both the waste load allocation (WLA) point sources (permitted) and the load allocation (LA) to nonpoint sources (unpermitted). Because wastewater treatment plant and municipal separate storm sewer system (MS4) loads fall under the WLA portion of the equation we recommend leaving the more detailed assignment of loads among the various TPDES permit holders to the development of the I-Plan, rather than stipulate these details in the TMDL itself. The Clean Water Act allows for some flexibility when writing individual permits but the inclusion of specific WLAs for each permit type limits implementation flexibility. In addition to providing increased implementation flexibility, a single WLA will more easily allow the use of pollutant load trading between wastewater and	No changes have been made based on this comment. In order to approve the TMDL, the EPA requires separate waste load allocations for WWTFs. The TCEQ is also required to break out the WLA into continuous (WWTF) and non-continuous (storm water) loads. The TCEQ readily takes actions to revise the WLA components of the TMDL in order to develop permits consistent with the TMDL. Water Quality Management Plan updates are minor changes to TMDLs to accommodate the re-allocation between individual permits and are processed by the TCEQ

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			storm water sources. EPA has approved TMDLs in other states using this approach. We strongly urge the TCEQ to use a single WLA for all point sources and to include discussion of water quality trading in the implementation section of the proposed TMDLs.	Executive Director approximately quarterly. Trading can occur between a variety of loading sources. The TCEQ encourages the exploration of this concept during implementation discussions.
051	7/3/08	Houston Council of Engineering Companies	Keep it Simple: The proposed TMDL uses three methods to determine load allocations and load reductions, a permit-by-permit load allocation for all wastewater discharge plants, and other details. The proposed TMDL includes a level of detail that may not be supported by the available data and the current understanding of the fate and transport of indicator bacteria in subtropical environments, in wastewater effluent dominated flowing freshwater streams, and with multiple, largely undefined load sources. Rather than include these extensive details, HCEC urges the TCEQ to use simple and direct means of determining the overall allowable load at all possible flow rates using only the load duration curve approach.	No changes have been made based on this comment. The allowable load was determined for three flow divisions—less than 30th percentile flows, 30th to 70th percentile flows, and greater than 70th percentile flows. The purpose of estimating loads for all sources in the TMDL is to evaluate whether a source is contributing to the high concentrations of indicator bacteria in the water bodies. This helps the stakeholders prioritize their efforts during I-Plan development.
052	6/16/08	Texas Parks and Wildlife	The subsection “Direct Deposition” addresses inputs from wildlife and other animals. This subsection discusses wildlife, feral animals, and pets, without clearly defining the terms. This might be confusing for stakeholders as the project moves into implementation, since strategies would be very different for dealing with bacteria loading from these different groups.	The report has been modified to add definitions.
053	6/16/08	Texas Parks and Wildlife	**Deer and Other Mammals** Deer population estimates were based on estimates reported from the Orange County Bacteria TMDL (page 60). According to that TMDL report, the numbers were based on population densities from Jasper and Newton Counties reported on the TPWD website. These counties lie in the Pineywoods Wildlife District (per the TPWD website) and have very dif-	No changes have been made based on this comment. The purpose of estimating loads for all sources in the TMDL, including animals in the watershed, is to evaluate whether a source is contributing to the high concentrations of indicator bacteria in the

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053 (cont.)			ferent deer habitat from the Oak-Prairie Wildlife District, which is the area closest to the watersheds of Buffalo and Whiteoak Bayous. Deer censuses are not conducted within the urbanized Houston metropolitan area, but are conducted in TPWD Resource Management Unit (RMU) 12 which may include part of the study area. TPWD does not have the resources to monitor deer populations at the watershed scale, but rather conducts monitoring to detect changes in populations within an RMU, which may cover multiple counties, range sites, watersheds, etc. Assuming that the deer-survey transects are representative of their respective RMUs, then the population density for the RMUs should (i.e., 95% confidence) fall within the upper and lower confidence limits shown in the table below. However, if the TMDL study area is a subset within RMU 12, we cannot be certain the 95% confidence level applies. Since the counts for the RMU represents, an average of several types of habitats, the values given may not be applicable for any single habitat type or sub-sample of habitat types. Nonetheless, the density estimates follow for the white-tailed deer populations in RMU 12 (Lockwood 2008). Southern Harris County is not good deer habitat (Schlitter 2008), so densities in the TMDL project watershed are expected to be lower than the mean density for RMU 12. Raccoons are expected to be present at higher densities than deer. No local data for raccoon populations is available. The highest raccoon density reported in the literature is about 630/sq. mi. (Lotze and Anderson 1979). Population densities varying from 6/sq. mi. to 52/sq. mi. are more typical (Kennedy et al. 1985, Lehman 1980, Moore and Kennedy 1985). For comparison purposes, we note that raccoon densities tend to be high in urban parks of the eastern United States, where habitat, food, and water are abundant. For example, a	water bodies. This helps the stakeholders prioritize their efforts during the development of the I-Plan. There are insufficient data available to reliably estimate populations and spatial distribution of wildlife and avian species by watershed. Consequently, it is difficult to assess the exact magnitude of contributions from wildlife species as a general category. The estimates developed here are intended to demonstrate the general magnitude of the contribution from these sources to allow a comparison of the importance of this category to other ones and to provide stakeholders with a guide to prioritize efforts during the development of the I-Plan.

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053 (cont.)			density of 48/square mile has been reported in Washington DC urban parks (Riley et al., 1998). Contributing mammals included in the bacteria load estimates were deer, raccoon, opossum, and rodents. All four mammal species/groups are assumed to be present At a total density of 3.5 animals/stream buffer acre, based on estimates reported from the Orange County Bacteria TMDL. An average loading rate of 2.03 x 109 MPN/day per animal was used. It seems odd that these animals, which differ greatly in body size, growth, reproduction and habitat requirements, would all have the same bacterial deposition rates. We wonder if there are any data to support these assumptions. TPWD staff feel that the following evaluation made in the draft "Nine Total Maximum Daily Loads for Bacteria in Clear Creek and Tributaries" (page 30) is more accurate: however, currently there are insufficient data available to estimate populations and spatial distribution of wildlife and avian species by watershed. Consequently, it is difficult to assess the magnitude of indicator bacteria contributions from wildlife species as a general category. These four mammal species/groups seem to be serving as surrogates for all wildlife in the area. As a result, it will be difficult in the implementation phase to make any specific wildlife recommendations based on the modeling results. In other bacterial TMDL efforts around the state, feral hogs have been implicated as a significant contributor to bacterial loads. We believe that feral hogs and nutria may also be important mammalian contributors to bacteria loads in the watersheds of Buffalo and Whiteoak Bayous. Dogs are the only pets discussed and specifically included in	Information on dog populations and *E. coli* concentrations in dog feces is readily available. The estimate, conducted as a part of the source assessment, shows that bacteria from dog feces are probably a source of indicator bacteria in the water bodies. The estimate also serves to give stakeholders developing the I-Plan a general magnitude

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			the bacteria load estimates. We wonder why other kinds of pets were not included in the estimates.	of the contribution of all animals. The estimate was not used to calculate the TMDL allocations.
054 054 (cont.)	6/16/08	Texas Parks and Wildlife	We appreciate that the discussion considered feral bird populations and wild bird populations separately. It is clear feral birds can multiply in disturbed areas such as cities, and contribute bacterial loadings to waterways. However, we do not understand the rationale behind the list of bird species in Table 21. The TMDL report states that bird densities in the table were estimated from the reference *Birds of North America.* If densities in Table 21 are extrapolated from the entire range of a bird species to the relatively much smaller watersheds of Buffalo and Whiteoak Bayous, the values, would be meaningless. It appears that this is indeed how Table 21 was generated, because of 40 species listed, 35 are assigned the same population density (0.000294 pairs/acre). The list of birds includes some species that are found in very low numbers in Texas, especially southeast Texas, and could not possibly pose a significant contribution to bacteria loads (Mottled Duck, for example). The population density numbers are in pairs/acre, which is only a relevant measure during breeding season and should not be applied to the entire year. The list contains some species which would not commonly be found in streams, but rather in flooded fields (Ross' Goose and Snow Goose for example). Some of the species listed are only present in Texas seasonally, not year-round. The last two species listed are "Yellow Crowned Night Heron" and "Yellow-crowned Night Heron"—surely the same bird? TPWD staff believe that the birds most likely to be found in or near Buffalo and Whiteoak Bayous would be some of the	Table 21 was updated to eliminate a duplicate entry. The purpose of estimating loads for all sources in the TMDL, including animals in the watershed, is to evaluate whether a source is contributing to the high concentrations of indicator bacteria in the water bodies. This helps the stakeholders prioritize their efforts during the development of the I-Plan. The TCEQ agrees with the commenter that there are insufficient data available to reliably estimate populations and spatial distribution of wildlife and avian species by watershed. Consequently, it is difficult to assess the exact magnitude of contributions from wildlife species as a general category. The estimates developed here are intended to demonstrate the general magnitude of the contribution from these sources to allow comparison of the importance of this category to other ones and to provide stakeholders with a guide to prioritize efforts during I-Plan development. The TCEQ believes an average density is sufficient for this TMDL as a prototype. The TCEQ agrees that there are differences of habitat and seasonal presence of the species listed in Table 21. Nonetheless, the table was not adjusted (except to correct a duplicate entry) due to the lack of a definitive approach.

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			herons, egrets, and ducks. TPWD has population estimates for ducks. However, just as was the case for deer, TPWD does not have the resources to monitor populations at the "square mile" or watershed scale. The surveys are designed to estimate duck numbers at no scale lower than the Ecoregion. As it is labor-intensive and expensive to obtain accurate animal counts, these data are not available for other avian species.	
055 055 (cont.)	6/16/08	Texas Parks and Wildlife	PWD recognizes that water is the basis for a significant recreational resource in Texas that includes boating, fishing, swimming, sailing, diving, bird watching, and paddle sports. TPWD has established as one of its major goals to maintain or improve water quality and quantity to support the needs of fish, wildlife, and recreation. We support TCEQ's efforts to improve and restore water quality through the TMDL process. Within the scope of its authority, TPWD is committed to assisting TCEQ in its efforts to restore full use of water bodies for which the contact recreation use is impaired. Specifically, TPWD has resources to assist both rural and urban communities in the implementation phase. For rural areas, TPWD Wildlife Division Technical Guidance biologists are available to assist landowners concerning local wildlife populations and habitat management. Staff can provide comprehensive wildlife habitat management plans for landowners wishing to improve wildlife populations and habitat on their property. These plans contain a comprehensive treatment of past and existing management and habitat conditions and recommendations that detail how to achieve goals on a specific parcel. See the TPWD "Landowner Services" brochure at <www.tpwd.state.tx.us/publications/owdoubs/media/pwd br w7000 0189.pdf>. For urban areas, TPWD administers a park grants program that helps to build new parks and conserve natural resources. See	No changes have been made based on this comment. The TCEQ appreciates the TPWD's willingness to assist rural and urban communities during the implementation phase of this project. Cooperation among agencies, communities, and stakeholders is a key element in achieving our shared goal of improving water quality.

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			<www.tpwd. state.tx.us/business/grants/>. An example of the type of situation where the Department might assist TCEQ could occur where unusual concentrations of wildlife contribute atypical amounts of fecal material to a river. The Department addressed this type of problem with a bat colony in a bridge over the San Antonio River on the River Walk. The Department assisted with making the bridge less attractive to bats so the colony would move from the site.	