COMMENTS RELATED TO SANITARY SEWER OVERFLOWS (SSOs)

Organization	Comments		Response
COH	8	Section 3.2.2. includes SSOs carried to the bayou through the MS4 as an MS4 source. Current national and regional EPA policy places SSOs under the responsibility of the sanitary sewer collection system operator. This is the basis of the proposed Capacity, Management, Operation, and Maintenance (CMOM) programs and is enforced through the WWTP NPDES permits. The discussion of SSOs should be moved to Section 3.2.1. and included in the WWTP loads.	Noted. SSOs have been moved as requested.
COH	10a	Section 3.2.2.3 should be strengthened to estimate the number of SSOs that occur within the subwatersheds but that do not lie within the City of Houston. Table 3.8 demonstrates that the majority of SSOs are the result of line blockages even taking into consideration that the reporting period includes both Tropical Storm Allison (June 2001) and one of Houston's wettest year's on record (more than 60" of rain in 2003).	Based upon rainfall data from the National Weather Service, rainfall associated with Tropical Storm Allison (TSA) occurred between 6/4/2001 and 6/10/2004. The next rainfall event after TSA occurred on 6/15/2001. Therefore any SSO events recorded between 6/4/2001 and 6/14/2001 were considered potentially influenced by TSA. The number of SSOs was updated as shown in Appendix A, Table 1.
COH	10b	The estimation of City of Houston's SSOs also does not reflect the extensive collection system rehabilitation and replacement that has been underway since 2005. A significant portion of the collection system will be renewed over a period that ends in 2014.	The data used in this analysis was obtained from the City and ranged between 2001 and 2003. Therefore the sanitary sewer rehabilitation information discussed is not relevant for this time period. The collection system rehabilitation can be incorporated into the implementation plan. To assist this process, a map was prepared that overlaid the areas targeted and completed for pipe renewal. Large portions of many subwatersheds in lower Buffalo and Whiteoak Bayous will eventually have signficantly reduced SSO contributions.
COH	10c	Even without acknowledging this ongoing and planned work, the Figure 3.3 does not appear to support the sewer age approach to predicting SSOs. It should be evaluated against the length of pipes installed in each year, or the number of SSOs per manhole should be graphed instead.	Figure 3.3 has been replaced with the figure shown in Appendix A Figure 1. This figure does normalize SSOs by the total number of manholes.
COH	10d	In addition, an uncertainty analysis should be conducted in conjunction with the sensitivity analysis of the defaults values obtained from the EPA SSO report to Congress.	An uncertainty analysis of EPA data is beyond the scope of this study and it does not assist is resolving the concerns with the SSO analysis. See TCEQ response #6 for a discussion of uncertainty in the TMDL study.
COH	11a	The SSO information presented in Section 3.2.2.4 and Table 3.15 should be moved to Section 3.2.1. and included in the WWTP loads.	Please see response to Comment 8 from City of Houston.

COMMENTS RELATED TO SANITARY SEWER OVERFLOWS (SSOs)

Organization	Comments		Response
HC	25	BLEST Spreadsheet Tab "SSO" – Column B and Column C is the number of dry and wet SSOs, respectively, from City of Houston SSO Database or estimated from housing age. However, the City of Houston SSO data base (Excel file titled ExcursionDataSentTo UH0605.xls) does not separate the dry and wet weather SSOs. Since many of the SSOs listed in the database do not specify the cause of the overflow, what was the basis for deciding which SSOs were dry or wet?	The City of Houston database uses codes to indicate the type of SSO event that occured. In the original analysis, all overflows related to pipe overloads were assumed to be related to wet weather. In the analyses that has been updated in response to stakeholder comments, wet weather SSOs were determined based upon rainfall as described in response to Harris County Comment 26 below.
HC	26	BLEST Spreadsheet Tab "SSO" – The SSO spreadsheet has 5 categories of SSOs: Blockage, Wet Weather Infiltration/Inflow, Mechanical or Power Failures, Line Breaks, and Miscellaneous. The four categories of SSOs beside "Wet Weather Infiltration/Inflow" are only assigned to dry weather. In reality, these SSOs also occur during wet weather. So in calculating wet weather SSO flow and loads, all five categories of SSOs should be included. Otherwise, the wet weather SSO estimation is much less than dry weather SSO (like Column E<Column D in the spreadsheet).	To address this comment, a database of rainfall was developed using rainfall from the National Weather Service and using data from Addicks as well as IAH and Hobby airports. Rainfall amounts for the previous 3 days were calculated. These data were joined with the SSO database, and any SSO occurring when rainfall during the previous 3 days was > 0.1 inches was considered to be rain influenced. Based on this assumption, it was determined that 23% of the SSOs were associated with rain events. Table 1 in Appendix A reflects that percentage, with 23% of the total SSOs being associated with wet weather and 77% associated with dry weather. Categories of SSO occurrences are no longer used to determine SSO loading.
		The Joint Task Force recognizes that sanitary sewer overflows represent a significant threat, and the City of Houston, the task force member which actually owns and operates a large and complex collection system, is spending millions of dollars annually to eliminate such overflows. At the same time, the JTF is grappling with the issue of being able to relate improvements in the collection system to the eliminated overflows to improved water quality. The majority of the comments below are based on questions about the manner in which the overflows were related to system component age, as well as the use of numbers from general EPA analyses in other areas in place of data generated in Harris County for estimations of the impacts of these overflows. It appears that the impacts may be overestimated throughout the process. While this may be a benefit to the JTF in terms of allocations from other sources, it may also provide disappointing results in water quality improvement from actions taken to control SSOs.	See responses to COH 8, 10a, 10b, 10c, 11a, and HC 25.

COMMENTS RELATED TO SANITARY SEWER OVERFLOWS (SSOs)

Organization	Comments		Response
HC	62	The Report indicates places SSOs as part of the MS4 load. Current national and regional EPA policy places SSOs under the responsibility of the sanitary sewer system collection system operator. This is the basis of the proposed Capacity, Management, Operation, and Maintenance programs and is enforced through the WWTP NPDES permits. The discussion of SSOs should be moved to Section 3.2.1 (dealing with wastewater treatment plant discharges) and the SSO loads should be included as a part of the wastewater treatment plant load.	Please see response to comment 8 from City of Houston.
HC	63	Harris County suggests using the words “empirically-calculated” rather than “known” in the last sentence, first paragraph of Page 33. To state that the number of SSOs inside the City of Houston is “known” indicates a naiveté about the reporting and response process for SSOs in general.	Noted. The sentence was revised to include the following language: "… the number of SSOs are empirically determined based upon a database….."
HC	64	In the SSO analysis on page 36, piping data seems to be limited to age. Analysis should be on further detailed data which impact potential for overflows, including piping construction materials, land use, and previous repairs or rehabilitation.	These factors do not contribute to characterizing the loads from these sources. This type of analysis should be an important part of the implementation process.
HC	65	On page 35-36, the SSO rate should be stated in terms of SSOs per mile of pipe of a particular age or per maintenance hole. Otherwise it could be that there are more SSOs in the pipes installed in the 1950s simply because there was a lot more installed in that period or it was the practice to build with greater number of maintenance holes. On Page 35, it states, “As demonstrated by the figure (Figure 3.3), older piping exhibits more SSOs than newer piping. Piping installed prior to 1940 exhibits significantly more SSOs than piping installed after 1940, with up to 20% of the installed maintenance holes having SSO occurrences”. However, in Figure 3.3, the greater number of SSOs occurs in the 1950s. Figure 3.3 should be plotted as “Number of SSOs per maintenance hole” versus “Year of Piping Installation”, not “Number of SSOs” versus “Year of Piping Installation”. The data should be normalized. Work Order 1, Draft Quarterly Report 2 explains that the SSOs were normalized by the total number of manholes on pipes built in a year and provides a normalized graph. That graph needs to be included here for the data to make sense. The graph indicates a different time period for the maximum failure rate.	See responses to COH 10c.
HC	66	The period of the raw SSO data is from January 6, 2000 to December 9, 2003, not March 12, 2000 to December 9, 2003, as stated in the Report (Page 33).	Noted. The dates have been changed as requested.

COMMENTS RELATED TO SANITARY SEWER OVERFLOWS (SSOs)

Organization	Comments		Response
HC	67	The USEPA report reference in the Report states EPA found that "…SSO frequency correlated positively with population density and exhibited regional trends (US EPA 2004)." However, the Report at page 35 states that regression analysis performed for the TMDL study show no statistically significant relationship either between the occurrence of overflows and population density or between overflows and land use. Please clarify.	A regression analysis was completed to find potential relationships between SSO occurrence and population data as well as SSO occurrence and land use. The regression results did not indicate statistical significance in the relationships. To eliminate confusion, the reference to this regression has been removed from the text.
HC	68	Page 42 of the Report states that "…(a)s can be seen in Figure 3.6, the method used for SSO estimation generally underestimates higher numbers of SSOs and overestimates lower number of SSOs". However, for the purposes of the BLEST, this method was considered adequate". Figure 3.6 shows that the estimated SSO/yr does not match the observed SSO/yr. The report does not give any description on why the method is considered adequate with underestimation of higher numbers of SSOs and overestimation lower number of SSOs as shown in Figure 3.6. Statistical analysis may be needed to show the acceptability of the estimated SSO. Why is the method considered adequate though errors exist in the method in estimating the number of SSOs?	Noted an alternative way to show how well the developed relationship fits the observed data is shown in Figure 2 in Appendix A. The figure reflects the new SSO analysis, neglects outliers and forces the regression line through zero to better evaluate the relationship. This figure demonstrates that the developed relationship accurately estimates the number of SSOs in the watershed. It is important to note that Figure 2 is different from Figure 3.6 in the report since some data were excluded because of Tropical Storm Allison. Figure 3.6 in the report shows all the data, including outliers, and a regression line that was fitted for the y-intercept.
HC	69	Page 43 of the Report states that it was difficult to locate and sample SSOs, and thus WWTP influent was sampled in both wet and dry weather (presented in Table 3.13) and that data was used to represent SSO concentration. According to the cited reference, EPA's *Report to Congress on Impacts and Control of CSOs and SSOs* . EPA 833-R-04-001 August 2004 (page 4-3), which collected actual community-level data, this approach overstates SSO concentrations by an order of magnitude.	As a clarification, the EPA Report states: "As shown, concentrations of fecal coliform found in CSOs and wet weather SSOs are generally less than the concentrations found in untreated wastewater and dry weather SSOs, and greater than the concentrations reported for urban storm water." In response to this comment, the wet weather concentrations for SSOs were reduced by an order of magnitude.
HC	70	Table 3.14 on pages 46-48 only has dry and wet weather SSO data. There is not a column of intermediate SSO data	The intermediate SSO load is equivalent to the dry weather load. This column has been added to the table and is shown in Table 1, Appendix A.
HC	71	In Table 3.14, page 46, these numbers could not be verified with the given explanation. Please provide an explanation.	Illustrative examples are provided in Table 2, Appendix A.
HC	72a	The Report states on Page 36 that "the average failure rate per maintenance hole was found to be 0.0219 SSO/maintenance hole/year", and on Page 40 that "the number of SSOs was calculated using the average failure rate of 0.0219 SSO/MH/yr presented earlier". However, based on Table 3.9 on Page 38, 0.0219 SSO /MH is for the period from 3/12/2000 to 12/9/2003, not for one year.	The correct value is 0.0219 SSO/MH.

COMMENTS RELATED TO SANITARY SEWER OVERFLOWS (SSOs)

Organization	Comments		Response
HC	72b	Also, why not calculate the number of SSOs by pipe age group (Table 3.9 on Page 38 already gives SSO distribution by pipe age), instead of calculating the number of SSOs using the averaged failure rate?	The average failure rate was not used but was provided to summarize the data. The percent of pipes per Census Community District (CCD) was used in conjunction with decadal failure rates as shown in Table 2 of the Appendix. To eliminate confusion, the discussion of the average failure rate was removed from the report.
HC	73	Page 45 of the Report states, "Based upon data from the US EPA SSO Report to Congress, it was assumed that 72% of the volume and load from the SSO event reached the stream". However, in Chapter 7 (Page 128-132) of the Work Order 6 Report (2004), two approaches were considered to estimate delivery rate of SSO loads to the bayou. Approach 1 estimated 43% of the SSO flows would be likely to reach the Buffalo Bayou. Approach 2 suggested that about half of SSO flows would have a substantial opportunity to soak into the ground or evaporate before reaching a bayou due to their distances to storm sewer and/or stream. Why not use the data specific to the Buffalo Bayou investigated in Work Order 6 here, instead of the EPA general data?	Noted. The delivery rate was changed to 43% for Buffalo Bayou and 39% for Whiteoak Bayou.
TXDOT	2j	**Consider Sanitary Sewer Overflows a part of the Wastewater Load Allocation**: Section 3.2.2. states that sanitary sewer overflows (SSOs) are part of the municipal separate storm sewer system (MS4) load. Current national and regional EPA policy places SSOs under the responsibility of the sanitary sewer system collection system operator. This is the basis of the proposed Capacity, Management, Operation, and Maintenance (CMOM) programs and is enforced through the WWTP NPDES permits (4). The discussion of SSOs should be moved to Section 3.2.1. and the SSO loads should be included as a part of the municipal wastewater treatment plant (WWTP) load.	Please see response to comment 8 from City of Houston.
TXDOT	2l	**Relationship Between Sewer Age and SSO Frequency Not Illustrated by Figure 3.3:** The document states that older piping exhibits more SSOs than new piping, however, the illustration does not indicate this. We suggest the assumptions and text be revised to be consistent with the illustrated data.	Please see response to comment 10c from the City of Houston.
TXDOT	2m	23. **SSO Frequency and Sewer Age Relationships Not Shown Correctly**: On page 35-36, the SSO rate should be stated in terms of SSOs per mile of pipe of a particular age or per maintenance hole. Otherwise it could be that there are more SSOs in the pipes installed in the 1950s simply because there was a lot more installed in that period or it was the practice to build with greater number of maintenance holes. On page 35 of the November 2006 Report, it states that "As demonstrated by the figure (Figure 3.3), older piping exhibits more SSOs than newer piping. Piping installed prior to 1940 exhibits significantly more SSOs than piping installed after 1940, with up to 20% of the installed maintenance holes having SSO occurrences".	Please see response to comment 10c from the City of Houston.

COMMENTS RELATED TO SANITARY SEWER OVERFLOWS (SSOs)

Organization	Comments		Response
		However, in Figure 3.3, the greatest number of SSOs occurs in 1950s. Figure 3.3 should be plotted as "Number of SSOs per maintenance hole" versus "Year of Piping Installation", not "Number of SSOs" versus "Year of Piping Installation". The data should be normalized. Work Order 1, Draft Quarterly Report 2 explains that the SSOs were normalized by the total number of manholes on pipes built in a year and provides a normalized graph. That graph needs to be included here for this data to make sense. The graph indicates a different time period for the maximum failure rate.	
TXDOT	2n	**Inconsistent Discussion of SSO Frequency and Population Density:** US EPA report reference in report states EPA found that "….SSO frequency correlated positively with population density and exhibited regional trends (US EPA 2004)." However, November 2006 TMDL report at page 35 states that regression analysis performed for the TMDL study show no statistically significant relationship either between the occurrence of overflows and population density or between overflows and land use. Please clarify.	Please see response to comment 67 from Harris County.
TXDOT	2o	**SSO Concentration Estimate Inappropriate:** Page 43 states that it was difficult to locate and sample SSOs, and thus WWTP influent was sampled in both wet and dry weather (presented in Table 3.13) and that data was used to represent SSO concentration. According to the cited reference, EPA's *Report to Congress on Impacts and Control of CSOs and SSOs.* EPA 833-R-04-001 August 2004 (page 4-3), which collected actual community-level data, this approach overstates SSO concentrations by an order of magnitude.	Please see response to comment 69 from Harris County.
TXDOT	2p	**Consider Sanitary Sewer Overflows a Part of the Wastewater Load Allocation:** As noted in Comment (1) above, the SSO information presented in Section 3.2.2.4 and Table 3.15 should be moved to Section 3.2.1 and included in the WWTP loads.	Please see response to comment 8 from City of Houston.

COMMENTS RELATED TO ON SITE SEWER SYSTEMS (OSSFs)

Organization	Comments		Response
COH	12	Section 3.3.1 includes failure rates and wastewater production rates for OSSFs that seem extremely high. These values indicate that every fourth home is discharging 195 gallons of raw sewage every day with 100% delivery to the bayou. This assumption does not appear to reflect real world conditions.	Data regarding failing septic systems were provided by Harris County. These data are now being used were instead of a default failure rate. The delivery rate is now a subbasin specific calculation. See Appendix B for discussion. Wastewater production rates are standard literature values.
COH	17	Table 3.26 currently shows the MS4 and OSSFs to dominate dry-weather loads and wet weather loads. This conclusion is based on unrealistic estimate of runoff loads from undeveloped areas versus developed areas and an overestimated of these two sources.	Noted. The OSSF assessment has been revised based upon data provided by the county and stakeholder comments. See Table 2, Appendix B for new values.
HC	27	BLEST Spreadsheet Tab "OSSF" – The delivery rate of the flow and bacteria from failed OSSF is 100% in the spreadsheet. It may be able to assume a 100% delivery rate in wet weather. In dry weather, it is most likely to be less than 100%	The delivery rate is now a subbasin specific calculation. See the supporting information provided in Appendix B in Figure 1 and Table 1.
HC	74	On Page 53, the Report states, "For subbasins more than 50% within Harris County, the density of septic systems was used to calculate the total number of septic systems in subbasins. For those subbasins with less than 50% of their area in Harris and those that were entirely outside of Harris County, the average of septic systems in the nearby regions was used to calculate loads instead." Why not use actual area within Harris County times the density of septic system in Harris County plus the actual area outside Harris County times the septic density in nearby region to calculate the total number of septic systems for the sub-watersheds partially within Harris County?	Septic densities outside of Harris County were estimated based upon an average septic density in the Harris County portion of the watershed. The final numbers of OSSFs are shown Table 2 of Appendix B.
HC	75	On Page 55, the Report assumes a delivery rate of 100% for failing OSSF flow and bacteria load reaching the bayou. This rate should be related to the distance between the failing OSSF and the bayou or its tributaries.	See response to comment 27 from Harris County.
HC	76	The H-GAC reference, Gulf Coast Regional Water Quality Management Plan Update: 2005, states that 10% - 15% OSSF systems in the H-GAC region do not function adequately (Pg 29, Reference 19-a). The Report used a failing value of 25%, which doesn't match the value of 10% - 15%. Harris County has determined a much lower county-wide OSSF failure rate of 7%, but at the same time note that OSSF failure is not homogenously found throughout the county. In fact, OSSF failures are concentrated in older, socio-economically-challenged communities, which are uncommon in the Buffalo/White Oak Bayou watersheds. In these watersheds, the OSSF failure is markedly lower than 7%.	Data regarding failing septic systems were provided by Harris County and these data were used instead. See Appendix B for discussion. See response to City of Houston comment 12.
HC	77	Does the septic density of 0.012 and 0.005 septic systems/acre for Fort Bend County and Waller County, respectively, exclude the area served by MUDs? These are typically no OSSFs within the service areas of MUDs.	Yes, all estimates (both previous and current) exclude areas served by MUDs. See response to Harris County comment 74.

COMMENTS RELATED TO ON SITE SEWER SYSTEMS (OSSFs)

Organization	Comments		Response
HC	78	A delivery rate of 100% is used in determining OSSF loads. Is there any scientific basis that 100% of flow from and OSSF enters the streams? This is not supported by Harris County's observations.	See response to comment 27.
HC	79	The Excel database Data Used Sept0825.xls, which was requested by the Project Team from Harris County and upon which OSSF calculations were based, presents the septic system data from 1991-2004. The database is difficult to understand without any description for each column (which was not provided), and may have led to misinterpretation of the data. Harris County remains available to offer information and technical expertise on OSSFs in its service area. No information on failure rate, bacteria concentrations in wastewater, and other data presented in Table 3.17 (Page 34) is available in the database.	The Sept0285.xls file was provided by Harris County. A meeting was held with County personnel on June 25, 2007 and a new dataset was obtained for use in BLEST.
HC	80	The database presents a summary of all new permits issued between 1991 and 2004 (Page 160, WO8 Report). Some facilities may have been converted to city sewers as they are annexed, or the areas may have been developed into subdivision served by MUDs.	This has been accounted for by excluding areas within MUDs. MUD data were current as of 12/24/2004 for Fort Bend County and 12/5/2005 for Harris County.
HC	81	In Table 3.18, page 56, the EC/FC ratio of 0.63 appears to have been applied here. As the purpose of this is to estimate fecal effluent from septic systems, the ratio would be much closer to if not 1.	Noted. This conversion has been eliminated.
HC	82	The Texas On-site Wastewater Treatment Research Council and TCEQ's onsite wastewater specialists have extensive expertise in the field of OSSF's, and first hand knowledge of the vast improvements that have occurred into this field over time. We recommend coordinating assumptions on OSSF's with these entities for validation.	Harris County provided new data that were used in BLEST.
TXDOT	2s	29. **Onsite Septic System Bacteria Loads Vastly Over-Estimated:** Section 3.3.1 and Table 3.17 vastly over-estimate the system failure rate, the volume of failure discharges per day, and the pollutant load delivery rate to the study water-bodies. These are major changes from earlier drafts of the study, and there does not appear to be any site-specific technical reason for the new assumed values in this section. In the early years of the study (2000-01) UH field personnel made direct observations along the bayous, up and downstream of Barker and Addicks Reservoirs. These observations found that septic system discharges were fairly low in concentration and flow and did not explain the high bayou levels observed. There were no reports that one out four homes in the unsewered areas experienced septic system failures with 100% delivery to the bayous, as assumed in the new document. At a minimum, the report should be revised to explain why either the field observations were greatly in error or that the new assumptions are in error and will be revised. Simply ignoring the study field data in favor of new assumptions is not acceptable.	OSSF loads have been recalculated based upon stakeholder input. Data regarding failing septic systems were provided by Harris County and these data were used instead. See response to City of Houston comment 12. The new loads and assumptions are provided in Appendix B, Table 3.

COMMENTS RELATED TO ON SITE SEWER SYSTEMS (OSSFs)

Organization	Comments		Response
		The new assumptions also appear substantially higher than the maximum amount of septic system bacteria loading that is physically possible, given the soils, watershed conditions, likely septic system locations and reasonable fate-transport process assumptions. It seems very unlikely that the septic system loads would be the same under the three weather/flow conditions. We would expect septic system loads to be lower during dry weather and higher during wet weather. In addition, the over-estimated septic system load will cause local stakeholders to inefficiently direct implementation resources to address a problem that is vastly over-estimated. This is inappropriate. See related Comment (r).	
TXDOT	2w	33. **Septic System Load Vastly Over-Estimated:** Table 3.26 C in Section 3.7 suggests that in dry weather the septic system load is about 97% of the bacteria in the streams. This claim is unique and supported only with selected assumptions. In Table 3.26 A, the septic system load to Segment 1014 is 48% of the dry weather total, although the area is almost entirely served by sanitary sewers. These calculations appear fundamentally flawed and need to be revised. See related Comment (n).	See response to TXDOT Comment 2s.
Jensen	5	Table 3.17 and 3.19 Assumptions on OSSFs—These assumptions seem extremely generous, and do not appear representative of the system. The specific aspects are noted below, and the topic is addressed in the discussion at the end of these comments. To assume that every fourth home is discharging 195 gallons of raw sewage every day generates high bacteria loads is very difficult to believe. If it were even remotely true it would be a major embarrassment for the TCEQ—that this much raw sewage was being dumped without a permit right under their noses and the agency couldn't smell it. It also does not take into account that even if a drainfield had become blocked allowing some of the effluent to surface, a situation that can occur if a system is not maintained for a sufficiently long period, the OSSF sources are widely dispersed. Flow through soil outside the drainfield would absorb bacteria in non-rain periods. In Table 3.19 the loads are predicted to be the same in dry and wet weather, something that could only be the case if every OSSF had an outflow pipe directly on a flowing stream, something else that is clearly impossible.	See response to TXDOT Comment 2s.
Jensen	6	Table 3.26 C Mouth of Reservoir analysis—This table suggest that in dry weather the OSSF load is about 97% of the bacteria in the streams. This figure is only based on assumptions. In Table 3.26 A, the OSSF load to segment 1014 is 48% of the dry weather total—in an area that is almost entirely served by sanitary sewers. These calculations appear fundamentally flawed. However, we understand the reasons behind the values and there is more discussion of the topic at the end of these comments.	See response to TXDOT Comment 2s.

COMMENTS RELATED TO ON SITE SEWER SYSTEMS (OSSFs)

Organization	Comments		Response
Jensen	7	3.8 Summary. The conclusion that the loads are the result of wet weather MS4 discharges, bed resuspension and OSSF loads is in substantial error. It is based on unrealistic assumptions on OSSF loads, and very unrealistic estimates of runoff loads from undeveloped areas versus developed (i.e. MS4) areas. It does include a reasonable effort to address background inputs (from birds, etc.), but it seems to completely ignore the effect of channelized streams carrying wastewater where regrowth and sediment resupply can be factors and where removal by settling is prevented.	Regulated stormwater and OSSF load calculations were revised based on specific data provided by stakeholders. Instream processes, including regrowth, die-off, settling, etc, are now explicitly described in the BLEST calculations. Previous work completed by Dr. Jensen as part of the TMDL technical team indicated die-off and settling in chamber and jar testing of bayou water and did not demonstrate regrowth. Results from the Jensen/PBS&J studies were used to incorporate instream processes into the calculations.

COMMENTS RELATED TO ON DIRECT DEPOSIT

Organization	Comments		Response
COH	14	Section 3.3.3 includes a discussion of direct deposition that is incomplete and inaccurate. Ducks and geese should be included in the estimations. The significant impact of migratory birds, utilizing the bayous and habitats immediately surrounding the bayous due to our high urbanization should be considered. Texas Parks and Wildlife could provide current, local data to estimate the density of wildlife in the Houston area rather than relying on inapplicable data from Virginia.	The Texas Parks and Wildlife Urban Division was contacted during several stages of the project to obtain information, but they had no information on the density of animals in the watersheds at the time. TPWD in a letter to the project team states that "urbanization causes many species of wildlife to decline or disappear as watersheds are altered by development" and that "the focus on wildlife is suprising since the TMDL process has revealed many potential sources of bacteria from human sewage in this densely populated urban area." The letter sent to TCEQ on March 13, 2006 is included in Appendix C. It should be clarified that deposition in this case is direct deposition over the actual waterbody. It is not intended to be representative of animals within the watershed. The effects of animals in the watershed are factored into the regulated storm sewer discharge load estimates, since any loads are washed into the storm network by runoff. The comments from COH on ducks, geese and migratory birds are certainly justified, however, there are no census data on the total number of birds that utilize the bayou.
HC	General	Buffalo Bayou and Whiteoak Bayous offer diversity and refuge to many species of wildlife amid urban development. These waterways are heavily used by many species of birds, mammals, reptiles and amphibians, which should be considered when determining the bacteria load into these bayous. This discussion on nonpoint source direct deposition greatly underestimates wildlife populations in the area, and hence their impact on bacteria in the bayou.	It is noted that direct deposition is into the water body and not over the entire watershed.
HC	94a	Using the percent contributions (Table 3.22 on Page 67) in calculating the bacterial contribution from birds may underestimate the bacterial loading during the season when these birds are in the Houston area. Aren't they actually present more than 25% of the year? The calculated loads (Table 3.23) are on a daily basis not a yearly basis. It seems that this adjustment of the percent contribution is unnecessary. Please clarify how this determination was made.	The direct deposition was revised. The contribution is included all the time, however, deposition only occurs 12 hours daily to account for other activities.
HC	95	In Table 3.23, an EC/FC ratio of .63 is used for fecal contaminants. Assuming such a ratio for animal species without empirical data is unjustifiable.	The ratio of 0.63 is used to arrive at the E. coli standard (geometric mean) from the fecal coliform standard. This is used because there is no satisfactory analytical strategy to establish a correlation under all environmental conditions. E. coli data are used when available and a ratio is not needed.

COMMENTS RELATED TO ON DIRECT DEPOSIT

Organization	Comments		Response
HC	96	Page 66 of the Report states, "Reported estimates from the Birds of North America publication are provided in Table 3.22, along with estimated population densities and percentage contribution of the particular bird species to the stream". On Page 68, it says that "A small buffer area around the bayou was estimated for each sub-basin based upon the length of the stream and width, … This buffer could basically be considered as direct deposition into the bayou…". Is the bird population density based on the entire region or based on the buffer zone?	It should be emphasized that direct deposition only represents deposition over the water body. It is not reflective of wildlife and water fowl present in the watershed, only in a buffer of 10 ft on either side of the bayou. The buffer zone is assumed to be the same width across the entire watershed. Contributions from wildlife residing in the watershed are reflected in the runoff loads calculated using EMCs from the Stormwater Joint Task Force.
		Waterfowl may concentrate in the buffer zone around the stream where the population density is higher than that based on the entire region. Does the buffer zone take into account the large agricultural and natural areas that attract wildlife? These natural areas include the portions of the reservoirs that remain wet much of the year, as well as the many parks (over 20,000 acres) in the watersheds, such as George Bush Park, Bear Creek Park, Cullen Park, Memorial Park, Terry Hershey Park, Eleanor Tinsley Park, and the parkways along White Oak Bayou.	Comment 102 from Harris County suggests that reservoirs are dry most of the year, which contradicts this comment. The Addicks and Barker reservoirs hold water only when gates are closed; thus they are considered dry the majority of the time. Watertfowl contributions from parks is included in the EMC values used to determine the storm water runoff contribution.
HC	97	In discussion of avian contribution to nonpoint source deposition into Buffalo and White Oak Bayou Watersheds, the Report identifies only 9 species of birds to estimate population and population density. Of the 275 bird species present in the Buffalo and White Oak Bayou watersheds (see attached list), why were these 9 species chosen as the basis to determine bacterial load from birds.	The species were selected as they had been observed by the research team in the bayou at various time throughout this study and because they were the most likely to be found wading in the water. The provided list of species present in Buffalo and Whiteoak Bayous is appreciated. Using that list, an additional 35 species were identified as having the potential to wade in the bayou. Therefore, these new species were included in BLEST and the population density assumed to be equal to the average of the original nine species, because no data were available to determine population densities for each individual species
		A few of these specifies, specifically the Roseate Spoonbill and the Reddish Egret, are strictly coastal and are not recorded inland within the Buffalo Bayou and White Oak Bayou watersheds. Conversely, Snowy Egrets are common in these watersheds and, contrary to Table 3.22. This section of the study apparently fails to take advantage of the free local expertise, including the regional office of Texas Parks and Wildlife, as well as Houston Audubon Society and the Bayou Preservation Association, the latter two groups of which have representation on the TMDL stakeholders committee.	This comment is in conflict with the list provided by Harris County of bird species in the watershed. Roseate Spoonbill was included as number 43 on the species list provided by Harris County. Thus, they were kept in the calculations. To address the concern about the Reddish Egret , however, this species was removed from BLEST. Snowy Egrets were described in Birds of North America as preferring estuarine environments (i.e., salt/brackish waters), however, they were added to BLEST based on Harris County's request. Appendix C, Table 1 provides a listing of the species now included in BLEST.

COMMENTS RELATED TO ON DIRECT DEPOSIT

Organization	Comments		Response
HC	98	Species accounts from the comprehensive Birds of North America series were referenced to identify population estimates, but the claims are not supported by the cited literature. Population densities were cited from this literature, but upon review, species population information was either completely missing, out-dated, or not applicable in this context.	Information included in *Birds of North America* was the most recent citations available. Bird population estimates are not widely available, and those that are available do not focus specifically on waterfowl found in the bayou. Therefore, best estimates were developed based upon professional judgment.
HC	99	Page 66 of the Report states," Southeastern Texas is the year-round home to many types of water fowl, including the White Ibis (Kushlan and Bildstein 1992), White-Faced Ibis (Ryder and Manry 1994), Roseate Spoonbill (Dumas 2000), Reddish Egret (Lowther and Paul 2002), Great Blue Heron (Butler 1992), Great Egret (McCrimmon et al. 2001), Snowy Egret (Parsons and Master 2000), Cattle Egret (Telfair 1994), and Neotropic Cormorant (Telfair and Morrison 2005)." Southeastern Texas is year-round home to all of these species, which is depicted by the range maps graphed in the cited literature. However, none of these species are waterfowl, and it is unclear why these particular species were chosen to estimate bacterial loads.	As detailed in the answer to Comment 97 from Harris County, these species were selected because they are typical of birds that spend a good portion of the day in the water. The definition of waterfowl in the context of this discussion is that provided by the Merriam-Webster Dictionary, "a bird that frequents water." All listed species are those that frequent water for food, thus they are considered waterfowl in this study.
HC	100	In Table 3.23 on Page 67, only the fecal coliform deposition rates for goose and duck are used to estimate the direct loading. The bird species discussed on Page 66 don't match those in Table 3.23. Is there any scientific basis that the fecal coliform deposition rates for duck and goose are representative of those for other birds?	It is assumed that the comment is referring to Table 3.23 on page 69. Limited data are available on bacteria deposition rates from animals, with deposition rates only available for ducks and geese. The deposition rate for these species was assumed to be the same as bacteria deposition rates for other avian species.
HC	101	The Report states that "The percent contribution to the stream was based upon bird behavior. Birds present in the Houston area only in the fall were assumed to have a 25% contribution throughout the year, while birds present in the water only a portion of the day were assumed to have a contribution of 50%." This is an inconsistent assumption, in that contribution of one species is defined by its seasonal occurrence (present in fall) whereas the contribution of another species is defined by time spent in the water during day, and as noted, the selected species are not a representative list.	Please see the response to Comment 94 from Harris County.

COMMENTS RELATED TO ON DIRECT DEPOSIT

Organization	Comments		Response
HC	102	The Report states, "Neotropic cormorants prefer water that is deeper, and, thus, they were assumed to be present only in the reservoirs". This statement assumes that Barker and Addicks Reservoir contain water, when, in fact, they are dry most of the year. Also, base flow in Buffalo Bayou is several feet deep, well within the required depth range for cormorants. The cited literature states the following about their habitat: "Remarkably versatile in climatic and environmental tolerance; inhabits a wide variety of wetlands in fresh, brackish or salt water….Inland, occupies broad slow-flow rivers; rapid mountain streams; Andean lakes up to 4,000-5,000 in elevation; and lowland lakes, marshes, swamps, and reservoirs". While the sympatric species, Double-crested Cormorant, is more common, both of these species can be found in and along Buffalo and White Oak bayous.	Cormorants have been added to all subbasins.
HC	103	The Report states "Final, the remaining birds were assumed to have 100% contribution, since there were no data to indicate other birds were present." Are these remaining birds of the 9 species listed or the 275 species actually present? Are they the species that are not a) only present in the Houston area during the fall, b) only present in the water and c) Neotropical Cormorants?	The remaining birds as mentioned in the report are the 9 species listed, which include the Roseate Spoonbill, the Great Egret and the Neotropic Cormorant.
HC	104	The Report states "In addition, other animals were also included in this assessment. The number of dogs swimming and defecating into the bayou were estimated based upon density estimates proposed in the 4 Mile Run TMDL completed in Virginia. These estimates proposed that in open space and park areas, the density of dogs would be 0.12 dogs/acre. In addition, the 4 Mile Run TMDL also developed density estimates for "other" animals, basically any animal that was included explicitly in the study, such as raccoons, nutria, rodents, bats and birds under bridges.	Noted.

COMMENTS RELATED TO ON DIRECT DEPOSIT

Organization	Comments		Response
		The density of animals was noted in the 4 Mile Run TMDL to be 8 animals/acre." One cannot assume that the density estimates for a site in northern Virginia would be the same as those in Houston. The Buffalo Bayou watershed includes an estimated 410,700 people (http://www.hcfcd.org/L_buffalobayou.html), while the Four Mile Run watershed includes 156,000 people (http://www.novaregion.org/fourmilerun.htm). In order for the Four Mile Run estimates to be applicable to Buffalo Bayou and Lower Oak bayou estimates, it should be a demonstrated that these sites share similar land-use/development, human population densities, and cultural, social, and economical characteristics of residents.	A new dog density was calculated using information obtained from several sources (the seventeen TMDLs prepared for bacteria in Orange County, the US Census and HCFCD). The approach is described in Appendix C and the final population density calculation is presented in Table 2 of Appendix C.
HC	105	Seasonal occurrence of birds should be classified as such: a) year-round residents – bird species present all year-round, with little or minor movements b) migrants (spring, fall or both) – bird species that are present only as they journey to/from their breeding and wintering grounds. Individuals of these species may linger in areas for a few hours to a week, but it is important to note that these individuals are moving through the area, and are NOT present throughout an entire spring or fall season c) summer residents – bird species that winter elsewhere (usually south), and are present during the summer months, usually to breed d) winter residents – bird species that usually breed further north, and present during the winter months.	Direct deposition is BLEST only accounts for loading directly over the bayou, or within a 10 ft. wide buffer, only. The animals included in the direct deposition analysis are not reflective of wildlife and habitat across the watershed. While the studies suggested are of enormous ecological value, they do not provide an estimate of direct deposition. As described in response to comment 94 from Harris County, the contribution from all birds was set to be 50% of the time on a daily basis.
HC	106	Buffalo and White Oak bayous are heavily used by many species of birds, mammals, reptiles, and amphibians, which should be considered when determining the bacterial load into these bayous. For example, directly over Buffalo Bayou, west of downtown Houston (Waugh Street bridge) is a Mexican Free-tailed Bat colony estimated at 250,000 bats, with an ability to consume up to 3 tons of insects in one night. The result of a night's feast is a corresponding deposit of guano (bat feces) directly into the bayou. Aquatic inhabitants, such as turtles and snakes should also be accounted for in the calculation of bacterial loading. In addition to the 275 species of birds present in the watersheds, there are 25 species of snakes, 18 species of anurans (frogs and toads), and 42 species of mammals, including 10 species of bats (see attached lists). Attached are several lists of species that can be observed within Buffalo and White Oak Bayou watersheds.	Direct deposition is BLEST only accounts for loading directly over the bayou, or within a 10 ft wide buffer, only. The animals included in the direct deposition effort are not reflective of wildlife and habitat across the watershed. There are no data on the bacteria direct deposition rate from bats nor are there good estimates of bat behavior to provide a basis for estimating loading rates. Indicator bacteria are intended to indicate risk from disease associated with mammalian species, not snakes, turtles, fish and toads.

COMMENTS RELATED TO ON DIRECT DEPOSIT

Organization	Comments		Response
HC	107	The Report cites the EPA Bacterial Indicator Tool, which presents the fecal coliform production rates (count/animal/day) for cow, hog, sheep, horse, chicken, turkey, duck, goose, deer, beaver, raccoon, and dog, all of which are present in the watershed. Why are only the rates for duck and goose used in the study (Table 3.23)?	All animals that would be expected in the study watershed were added to the rate analysis in BLEST, including dairy cow, beef cow, hog, sheep, horse, chicken and turkey. See Table 3 in Appendix C for a listing of all species used to calculate the final geometric mean loading rate in BLEST.
Pechacek	11	This section of the November 2006 BB/WOB TMDL Report significantly lacks content. It seems that the research team did not go into the field and conduct a species survey, but rather, pulled together some information based on loose assumptions. Perhaps discussions from a 2005 bacteria TMDL stakeholders meeting had a hand in guiding this attempt. Back in 2005, it was indicated that regardless of the actual and true loading currently resulting from direct deposit by wildlife, the background load would have to be written to meet the stream standard. Was the actual loading ignored in favor of an artificial load value that has no verifiable basis? How could the research team totally ignore feral rock doves (pigeons) given that pigeons are omnipresent, nesting under every bridge and sitting on power lines that crisscross the bayous?	The scope of work for the project did not include a species survey. Stakeholders recommended using existing resources, such as TPWD personnel, literature values, etc. Load from direct deposition was based upon population data from *Birds of North America* source books. The calculated load has a basis in actual surveyed bird populations and deposition rates were obtained from US EPA documents, among others. It is indeed true that the load is an estimate, but it is not "artificial." It should be noted that direct deposition is intended to represent contributions from birds directly over the water body, and is not intended to be representative of all species within the watershed. Neglecting feral rock doves was not intentional. Feral rock doves were added to subbasins where bridge crossings occur. See the discussion in Appendix C along with Table 4.
Pechacek	12	As an avid birder, I enjoy seeing the variety of wildlife in the urbanized setting along White Oak Bayou. I have attached photographs from White Oak Bayou which show some of the bayou features and wildlife found within the channel or along the banks. Unfortunately, I did not have the luxury of a nature blind to sit in, so often times as I walked up to take the picture, I would spook the wildlife. Hence, I was unable to get any photos of the many turtles and great blue herons found along the channel. I also did not get the double-crested cormorants, 13 of which have lived along the bayou over the last year.	It is clear from the comments that the stakeholders value the natural habitat offered by the bayous. It is important to note that the deposition load estimate is intended to include direct deposition over the water body and not deposition over the watershed areas. The latter is part of the runoff load estimate through the EMCs measured by the Storm Water Joint Task Force. Direct deposition over the bayou is estimated using the bayou width plus a ten-foot buffer on each side which is then used with the deposition rate to obtain a load. Cormorants were assumed to be in all watersheds of the bayous.

COMMENTS RELATED TO ON DIRECT DEPOSIT

Organization	Comments		Response
Pechacek	13	Photographs 1 and 2 show the geometry of White Oak Bayou. Although concrete-lined in this section, it has various snags within the channel which result in back water ponding that allows for sediment deposition. Thus, I disagree with the research team's assumption that the concrete lined portion of the bayou has no additional E. coli loading from sediment resuspension. Also see Photograph 3, which shows a large area of deposition within the channel.	No data were provided in this comment to allow calculation of resuspension of sediment in the concrete lined portion of the channel. Calculations undertaken by the project technical team for bed sediment resuspension suggest that the concrete portions of Whiteoak Bayou are not amenable for sediment deposition (see Appendix E). While it is possible that certain parts of the stream could have eddies or areas blocked by debris that slow velocities, these anomalies are not accounted for in BLEST.
		The wildlife documentation begins with the fish, Photographs 4-7. The Bayou is teaming with fish, I think they are carp and perch. The fish attract the great blue heron, the double-crested cormorants, the snowy egrets and all the other wildlife that eat fish. Those birds are found here year round. Photographs 9-11 show egrets in the center of the photographs. Photograph 12 shows a back slop drain area into the bayou where the egrets like to hang around. Photograph 13 shows spotted sandpipers. This flock of sandpipers has been there since September 2006, when I first noticed them. Killdeer can also be found along the edge of the bayou year round. Photograph 14 shows another back slope area where a large flock of robins were feeding in the grass. Unfortunately, I disturbed them and most flew away before I could snap the picture.	It is clear from the comments that the stakeholders value the natural habitat offered by the bayous. It is important to note that the deposition load estimate is intended to include direct deposition over the water body and not deposition over the watershed areas. The latter is part of the runoff load estimate through the EMCs measured by the Storm Water Joint Task Force. Direct deposition over the bayou is estimated using the bayou width plus a ten-foot buffer on each side which is then used with the deposition rate to obtain a load.
Pechacek	14	The next series of photographs show the ever present pigeon population. They nest under every bridge that crosses White Oak Bayou, and can, often times, be seen sitting on the electric wires crisscrossing the bayou. Although hard to make out, Photographs 15-16 are of nesting pigeons under a bridge. Photograph 17-18 are pigeons on the wire. I had to take two photographs to get all of the pigeons sitting on the same wire. I estimated that where were over 350 pigeons sitting there. I took close-up shots so I could count. Photographs 19-21 show pigeon droppings on the concrete sloped paving under the wire where the pigeons in Photographs 17-18 are roosting. And therein lies one of my most significant concerns that this study has not adequately addressed, the sources of bacteria as related to wet weather flows.	Bird roosting under bridges in both bayous were re-estimated and included in BLEST. See Appendix C for development of these inputs.

COMMENTS RELATED TO ON DIRECT DEPOSIT

Organization	Comments		Response
Pechacek		The photographs of the pigeon droppings are near the top of the sloped paving. Although the droppings are from direct deposition, the droppings just build up on the slope paving during dry weather conditions. The longer the antecedent dry period, the greater the build-up. During last spring and summer, the smell of ammonia was detectable under several of the bridges from the build up of bird droppings. So, the bacteria from the bird droppings during dry weather are not washed off the bayou until a storm event, perhaps something on the order of a 2-year storm (about 5.5 inches) or larger occurs. Then, presumably, the extremely high bacteria counts resulting from direct deposition mistakenly become attributed to wet weather flows from storm sewers.	EMC data from the Stormwater Joint Task Force accounts for wash off, whether from wildlife or urban sources. It is not possible to differentiate between the two sources.
Pechacek		It is inaccurate to input a constant loading value representing direct deposition for all 3 flow scenarios into the BLEST tool. The load reductions required to meet the state stream standards then calculated by the BLEST tool will also be inaccurate, because the loading is not the same for all three flow scenarios. The BLEST spreadsheet will only be as good (or bad) as the quality of data populating it and whether its construct is applicable to reality.	Direct deposition represents loads into the stream itself during dry weather. This load is inappropriate for wet weather conditions. Any fecal matter from direct deposition on surfaces is modeled through the EMC wash off coefficients obtained from the Stormwater Joint Task Force data. Loading from direct deposition during wet weather was removed from BLEST.
TXDOT	2u	31. **Direct Deposition in Load Allocation Under-Estimated:** The discussion and presentation of the sources of direct deposition in Section 3.3.3. is incomplete and inaccurate. Ducks and geese should be included in the estimated of waterfowl density in Table 3.22. Furthermore, Harris County lies squarely in the Central Flyway, and as such receives a great influx of migratory birds. Many of these birds are forced to utilize the habitats immediately surrounding both of these bayous due to urbanization. It is inaccurate to assume that waterfowl will have the greatest contribution of all birds utilizing the bayou (especially those that nest in congregations suspended above the bayous), and it is suggested that the total number of birds that utilize the bayous and their total bacteria contribution be estimated instead. The use of Virginia data to estimate the density of wildlife in Southeast Texas is inappropriate as the ecosystems are very different. Texas Parks and Wildlife should be consulted to estimate the density of animals utilizing these watersheds.	This comment is similar to comment 14 from City of Houston. See the response to that comment above.

COMMENTS RELATED TO REGULATED STORM WATER DISCHARGES

Organization	Comments		Response
COH	6	The definition of dry, intermediate and wet weather conditions needs further clarification and description of the justification for selection of these rainfall and flow amounts. The selection of 0.8 inches in a 24-hour period does not appear to reflect a true wet weather condition in the Houston area. After periods of dry weather, up to and sometimes more than an inch of rain can be absorbed by the soil before runoff occurs. The City of Houston believes that a wet weather condition should be consistent with design criteria for wastewater wet weather facilities or correlate to a volume and rate of flow at which recreational activities would be unsafe. This was previously discussed in relation to a high-flow cut-off in the March 7, 2006 letter.	The wet weather condition refers to the conditions in the stream based on the flow duration curve. For Buffalo and Whiteoak Bayous, the flow duration curve was divided into 3 flow regimes: Low Flow (0-30 percentile), Intermediate flow (30 to 70th percentiles) and High flow (70th and above). In the context of the TMDL, the wet weather condition is associated with high flow conditions in the stream. Low flow is primarily wastewater discharges, intermediate flow includes a mixed flow regime of wastewater discharge and rainfall runoff, while high flow is primarily rainfall runoff.
COH	9	In Section 3.2.2.2., the EMC numbers do not appear to accurately reflect local conditions. The values for cultivated, grassland, woody land, wood wetlands, and non-woody wetlands seem far too low. The values presented in this study do not appear to be representative of the runoff contribution compared to other studies readily available for TCEQ.	Noted. The EMC values for cultivated, grassland, woody land, wood wetlands, and non-woody wetlands were changed to the transitional value measured by the Stormwater Joint Task Force between 1992 and 1993. The fecal coliform concentration measured by the Joint Task Force is 44,632 MPN/dL. See Table 1 in Appendix D. This value is converted to E. coli equivalence by using the EPA 0.63 ratio and is now used for the categories referenced above.
HC	11b	In defining the dry, intermediate and wet conditions for the allocation determination, the Report sometimes defines the condition based on flow (e.g. 10-20 MGD "higher than dry condition" on Page 5), and sometimes on precipitation ("precipitation of 0.8 inches over 24 hours" on Page 5). Various definitions were used in defining these conditions, for example: 1. "Intermediate condition events are considered those when rainfall is between 0.25 and 0.5 inches of rainfall per day" on Page 13, 2. "Rainfall greater than 0.5 inches represents conditions under which biosolid releases may occur" on Page 13, 3. "It was assumed that the average rainfall event in the Houston area, equivalent to 0.8 inches of rain,…was representative of wet weather conditions" on Page 26 4. "The amount of nonpoint source load and flow accounted for the intermediate condition was based upon the amount of flow needed to be added to the dry weather scenario in order to achieve median flow…" on Page 28, 5. "Samples were collected only during dry weather, which was roughly defined as a period of three or more days with less than 0.1 inches of rainfall in the immediate sampling area" on Page 23.	Noted. The discussion has been rewritten to avoid confusion. See response to Comment 6 from City of Houston.

COMMENTS RELATED TO REGULATED STORM WATER DISCHARGES

Organization		Comments	Response
		It seems that some of these definitions are not equivalent or corresponding to others. In addition, the basis of these definitions is not clear. Are these definitions based on any statistical analysis of precipitation and flow data?	See Table 2 in Appendix D for detailed definitions.
HC	12	The National Oceanic and Atmospheric Administration (NOAA) (at http://cdo.ncdc.noaa.gov/cgi-bin/HPD/HPDStats.pl reported the following data at the Addicks reservoir for the period 1943 – 1999. Annual precipitation: 44.191 inches Number of wet days (>or=0.1 inches): 53.917 Number of wet days (>or=0.01 inches): 74.395 On Pages 17, 24, and 29 of the Report, a value of 74 days of precipitation out of a year is used as the total number of wet days per year. (From the NOAA data, this is the number of wet days with a precipitation greater than or equal to 0.01 inches.) On Pages 5 and 26 of the Report, a value of 0.8 inches over 24 hours is used to represent wet weather condition. This is obtained by dividing the annual precipitation, 44.191 inches by 53.917, equaling 0.82 inch/wet day. Using the number of wet days greater than or equal to 0.01 inches; 44.191/74.395 = 0.59 inch/wet day. Why was 74 days, the number of wet days greater than or equal to 0.01 inch, used as the total number of wet days per year; while 53.917 days, the number of wet days greater than or equal to 0.1 inch, was used to calculate the daily rainfall for the definition of wet weather? Why was the average rainfall of 0.8 inches/wet day considered to be representative of wet weather condition (Page 26 of the Report)? We recommend performing statistical analysis on rainfall/flow data to obtain the exceedance pattern, and then define the dry, intermediate and wet weather regimes based on the statistical analysis.	The value of 0.8 inches is the average storm rainfall amount. This value was taken directly from the NOAA rainfall statistics (item # 4 from the Hourly Precipitation Data Rainfall Event Statistics for Addicks) and is not a calculated value. Based upon this comment, the rainfall amount associated with the instream wet weather flow condition (> 70th percentile) was recalculated as follows: The value of 0.59 inches was calculated from the Addicks National Weather Service Rainfall Gage as the average annual rainfall for the period from 1943 - 1999 of 44.191 inches divided by the total number of rainy days where rainfall is greater than 0.01 inches at that gage during that same period (74 days). The three conditions, dry, intermediate and wet, are based on the flow duration curve for the stream as discussed in the response to City of Houston Comment 6. For the wet weather instream flow conditions, the 0.59 inches per day for 74 days will generate the total average annual rainfall that was recorded at the Addicks Rainfall Gage (see previous response to Harris County, Comment 12). It is noted that the 0.59 in does not represent a specific storm event, but rather the average daily rainfall amount that would fall on rainy days during a given year.
HC	14	How are releases from the Barker and Addicks reservoirs treated in the dry, intermediate and wet conditions? The Report (page 4) states, “Dry weather loads are defined as those present in the bayou when the bayou flow is close to that maintained solely by WWTP effluent.” However, in the Houston area the US Army Corps of Engineers releases water from Addicks and Barker reservoirs during dry weather, at times in large quantities and for long durations.	The reservoirs are treated as an input from the "Load Analysis for Mouth of Watersheds Draining Reservoirs" into Segment 1014. All upstream inputs are included in the Load Allocation (LA) portion of the load calculation. The upstream flow is held constant, but the upstream loading is equivalent to the TMDL target load. An example of this calculation can be found in Appendix D. No changes were made based upon this comment.

COMMENTS RELATED TO REGULATED STORM WATER DISCHARGES

Organization		Comments	Response
HC	21	On Page 26 of the Report, it is stated that the average rainfall event in Houston area, equivalent to 0.8 inches of rain, was representative of wet weather conditions. The rainfall volume of 0.8 inches was used to calculated flows (Columns T-AA) and then loads (Columns L-S) for various land uses using the CN number method. The unit of the flow and load is inch3/event and MPN/event, respectively. The flows and loads were then added up to get the total flow (Column AC) and load (Column AB) for each subbasin for high flow condition. The unit of Columns AC and AB is MGD and MPN/wet day.	The 0.8 inches of rain does not represent a single rain event. See response to COH 6 and Harris County Comment 11b for discussion on average rainfall.
		One rainfall event may cross more than one day and on a day there may be more than one rainfall events. How can the sum of flow in unit of inch3/event or load in unit of MPN/event become flow in unit of MGD and load in unit of MPN/wet day? If this is true, in addition to the assumption that a 0.8 inch rain event represents wet weather condition, the Model must also assume that there is exactly one rainfall event during a wet day. This assumption is not real-to-life.	Noted. However, the 0.8 inches of rain does not represent a single rain event. In the TMDL, the load is estimated on a daily basis. The wet weather load is based on rainfall events during rainy days. In this case, and based on the National Weather Service Addicks gage, the average annual rainfall for the period 1940-2000 is 44.191 in. Additionally, this amount of rainfall is expected to fall over a period of 74 days. Thus, on a daily basis, dividing the 44.191 inches into the 74 days generates 0.59 inches. This rainfall amount was used to estimate the daily wet weather load due to rainfall.
HC	22	The spreadsheet uses an Intermediate Factor obtained from Tab “MS4 median” to calculate the Intermediate flow and load (Columns AE and AD). However, in calculating the intermediate flow and load for WWTPs, a rainfall of 0.25 inches is used (see Tab WWTP). Why the same Intermediate Condition uses different standard? Why not use rainfall volume which represents the Intermediate weather condition for the CN number equation to calculate the Intermediate flow, and then use this Intermediate flow to calculate the Intermediate load?	Intermediate incremental flows due to infiltration and loads for WWTPs were estimated based on a detailed statistical correlation between WWTP flows under wet weather conditions and amount of rainfall at four City of Houston Plants. It was determined that two wastewater flow regimes existed and that were associated with rainfall amounts between 0.25 in and 0.5 in (Figure 1(a) in Appendix F) and rainfall amounts greater than 0.5 in (Figure 1(b)). Thus, the intermediate condition was associated with 0.25 in rainfall while the wet weather condition was associated with 0.5 in. It is also noted that the instream intermediate condition is not based on a specific amount of rainfall but rather is based on balancing the flow in the bayou to make up what is not contributed by wastewater flows towards the median flow in the bayou. See response to City of Houston comment 6 for additional clarification.
HC	23	BLEST Spreadsheet Tab “MS4Medium” – How to get the Segment Dry Flow (H21-H24) and Segment Runoff (G21-24) in this spreadsheet (cannot see the formula behind the cell because the spreadsheet is locked)? Why is the dry flow for Segment 1013 zero in the spreadsheet? The spreadsheet used the median flow at the mouth of each reach as the intermediate condition. Page 28 of the Report states, “To determine runoff loading for the intermediate condition, a portion of the nonpoint source flow and load were assumed to be occurring.	Rows G21-G24 represent a summation of the wet weather flows from the subbasins in each segment due to runoff. Rows H21-H24 represent the summation of dry weather wastewater flows for all plants in each segment. The dry flow for Segment 1013 is zero because there are no WWTPs in Segment 1013.

COMMENTS RELATED TO REGULATED STORM WATER DISCHARGES

Organization		Comments	Response
		The amount of nonpoint source load and flow accounted for the intermediate condition was based upon the amount of flow needed to be added to the dry weather scenario in order to achieve median flow". Why is the Intermediate Condition the flow at Median Flow here, while in calculating the WWTP load, the Intermediate Condition is the condition with a rainfall of 0.25-0.5 inch per day? What is the basis of Intermediate Condition = Median Flow? How can we know if the median flow is in the base flow range or not? If it is still in base flow, there is no runoff flow and load occurring.	The intermediate condition refers to instream flows in the bayou, defined to be between the 30th and 70th percentiles from the flow duration curve. The mid-point of that range is 50th percetile, which is the median flow. Thus, to calculate the load contribution from runoff under intermediate instream flow conditions, the difference between the median flow and the dry weather WWTP flow was associated with regulated stormwater discharges. See response to Harris County Comment 22 for additional clarification.
HC	24	BLEST Spreadsheet Tab "MS4Medium" – The BLEST spreadsheet indicates, "For segments without USGS gages at outlet, a ratio of drainage areas in conjunction with the Dairy Ashford median flow was used to find median Q instead." The flow is not always proportional to the drainage area. The flow (base flow or storm runoff) is affected by a number of hydrologic/hydraulic properties of the watershed/water course in addition to the drainage area. For streams where effluents from WWTP are a major source of base flow (such as Buffalo and White Oak Bayous), the flow may be primarily affected by the locations and amounts of WWTP effluents. If a reach is not to long and the area of its associated subbasin is not too big, this method may be used to obtain an approximate flow for runoff. It is questionable if this method was used to estimate median flow. In addition, Segment 1017, 1014 and the Buffalo Bayou above the Reservoir are long reaches and cross big subbasins with significantly different land uses. The method mentioned above (i.e. using a ratio of drainage area to estimate the flow) may not be suitable to estimate flow at reach mouth for these long reaches with a big area of subbasin. The following method can be used as a check if the method is valid: USGS has flow gages at Shepherd, Piney Point, West Beltway 8, and Dairy Ashford. The ratio of drainage areas in conjunction with the Dairy Ashford median flow can be used to estimate the median flow at Piney Point or Shepherd, and then compared to the observed median flow at Piney Point or Shepherd. An alternative check method follows: A hydrology-calibrated HSPF model for Buffalo Bayou was already developed. Why not use the model generated flow at the mouth of Segment 1014 and 1013 for this analysis. It would be more accurate.	Noted. There are numerous methods to estimate flow from an ungaged watershed, one of which is a drainage area ratio. In response to this comment, flows calculated using the drainage area method were compared to those calculated using HSPF. The results of this analysis are presented in Appendix D, Table 3. From the results, it can be seen that the caculated flows using a simple approach are similar to flows predicted by HSPF. Based on Stakeholder comment however, HSPF flows are now used.

COMMENTS RELATED TO REGULATED STORM WATER DISCHARGES

Organization		Comments	Response
		Or, in keeping with the Project Team's existing method, why not use the gaged median flow at Shepherd instead of the one at Dairy Ashford to find the median flows at the mouth of Segments 1014 and 1013? The USGS flow gage at Shepherd is much closer to the mouth of Segments 1014 and 1013 than the gage at Dairy Ashford.	The Shepherd gage is unuseable because it only records runoff events. Thus, the median from the Shepherd gage represents the median during high flow events, not the median for the entire flow record.
HC	56	Table 3.6 on page 27 of the Report depicts a mixed runoff situation where there is most assuredly an EC/FC of less than 1. This table defaults to the ratio used in the Water Quality Standards. However, without empirical analytical data to verify this ratio, the EC numbers could be much higher or much lower.	Noted. The ratio of 126/200 MPN/dL is a ratio from EPA standards and is used to convert the JTF EMCs from fecal coliform to E. coli. The JTF did not measure E. coli. When E. coli data are measured, the data can be used and the conversion would not be necessary.
HC	57	Page 26 of the Report states that the average rainfall event of 0.8 inches in the Houston area was representative of wet weather conditions and this single average value was found to be adequate in determining non-point source loads. Please describe the basis for the assumption that a single value of 0.8 inches is adequate in the calculation.	See response to Harris County comment 12.
HC	58	On page 28, the Report states that the event mean concentrations (EMCs) used in the analysis were obtained from two sources: the Storm Water Joint Task Force Annual Report (2002), and a study conducted by Newell et al (1992) that compiled EMCs for the Houston areas for years prior to 1991. Please clarify how the two different EMCs sources were used in the TMDL study and what assumptions were made associating land cover types with the two sets of EMCs.	Noted. Based on this comment, JTF EMCs are used throughout. See Table 1 in Appendix D.
HC	59	On Page 4, the Report defines MS4 discharge as a waste load allocation (point source). On Page 28, the reports states that "To determine runoff loading for the intermediate condition, a portion of the nonpoint source flow and load were assumed to be occurring". The discussion on page 4 should clarify why MS4 discharges are treated two-different ways.	Noted. The terminology "nonpoint source" was changed. Based on a similar comment from Linda Pechacek (comment 5) references to MS4 discharges have been replaced with "regulated stormwater discharges" to reflect the appropriate categorization of these discharges.
HC	60	On page 28 of the Report, how were the values of 10%, 3%, 4% and 0.1% of the nonpoint source runoff at each segment to achieve median flows determined? Provide calculations for these values.	As mentioned in response to comment 59 from Harris County, the terminology "nonpoint source" was changed. See response to comment 23 from Harris County on intermediate flow conditions. The 10%, 3%, 4% and 0.1% are calculated as follows: **median flow in the bayou minus dry weather flows from WWTPs in the segment / total wet weather flow from runoff for the segment.**
HC	61	As noted in comments #35 and #39 above, stormwater EC/FC ratio should be confirmed analytically.	E. coli data are used when available. In the absence of E. coli data, the EPA regulatory ratio of 126/200 is used because there is no satisfactory analytical starategy to establish a value under all conditions. There is no need to use the ratio when E. coli data are available.

COMMENTS RELATED TO REGULATED STORM WATER DISCHARGES

Organization		Comments	Response
HC	108	The Report states that "It was assumed that the average rainfall event in the Houston area, equivalent to 0.8 inches of rain, based upon the average between 1943 and 1990, was representative of wet weather conditions. More complex analyses could involve the use of rainfall depth distribution, but for the purposes of the BLEST analyses this single average value was found to be adequate in determining non-point source loads". Why is it concluded that the single value of 0.8 inches rainfall is representative of wet weather conditions and is adequate for the BLEST analyses in the estimating of runoff flow using curve number method? Were the results of the analyses using the single value and using a rainfall distribution pattern compared? We recommend a statistical analysis be performed to distribute the rainfall using a rainfall statistical program, e.g. SYNOP.	Noted. See response to comment 12 from Harris County.
HC	109	The CN numbers for some land uses (e.g. low intensity developed and high intensity developed) used in the November 2006 Report (Table 3.6 on Page 27) has been changed in comparison of those used in WO 8 Report (Table 9.10 on Page 162). Why were these changes made?	The low and high intensity curve numbers were adjusted using Figure 2-4 in the NRCS document, *Urban Hydrology for Small Watersheds*, to reflect unconnected impervious areas.
HC	110	The EMC values of fecal coliform and/or E. coli for some land used in the Report (Table 3.6 on Page 27) has been changed in comparison of those used in WO 8 Report (Table 9.9 on Page 162). Why were these changes made?	Noted. EMC values have been changed in response to Linda Pechacek (comment 5) so that JTF EMCs are used for all land use categories. See Table 1 in Appendix D.
HC	111	Page 28 of the Report states, "The land use for the EMCs employed in this analysis did not always match the types of land cover described by H-GAC. Assumptions were therefore made about the appropriate EMC for each land cover type….". What assumptions were made to link the land use for the EMCs to H-GAC land use? How were the Fecal Coliform EMCs for Low Intensity Developed, High Intensity Developed, and Transitional in Table 3.6 obtained?	Table 1 in Appendix D presents the HGAC land use designations and their corresponding Storm Water Joint Task Force categories.
HC	112	For the intermediate condition, the Report states on page 28, "The amount of nonpoint source load and flow accounted for in the intermediate condition was based upon the amount of flow needed to be added to the dry weather scenario in order to achieve median flow". Why is the median flow condition considered to be the intermediate condition?	See response to Harris County comment 23.

COMMENTS RELATED TO REGULATED STORM WATER DISCHARGES

Organization		Comments	Response
Jensen	4	4. Table 3.6 Wet MS4 calculations--The EMC values for developed land seem in the right order, but those for cultivated, grassland, woody and wetlands seem far too low (1,000 to 3,000 mpn/dL). The City of Austin monitored EMC values for over 15 years for both FC and fecal strep and has found that high concentrations exist in runoff, independent of the land use or level of impervious cover (CoA-ERM/WQM 2006-1). The average FC EMC for imperious cover ranging from 5% to 100% was 42,625 cfu/dL. The average EMC value for fecal streptococci was 69,004 cfu/dL, for all land uses and amounts of impervious cover. Values of less than 3,000 mpn/dL are not representative of the runoff contribution from any known site or land use. This may be important because it will bias the runoff load towards MS4 sources and away from less developed land.	Noted. The undeveloped value from JTF EMC Report was used in lieu of the GBEP study. The JTF fecal coliform EMC concentration of 44,632 MPN/dL is comparable to the Austin study values. See Table 2 in Appendix D. (I think this should be Table 1.)
Pechacek	1	This study has failed to adequately identify the sources of bacterial impairment, especially those related to wet weather flows. Adequate identification of the wet weather sources of bacteria should be completed before developing the TMDL calculations, because wet weather flows have been earmarked for the greatest reductions in bacteria loadings to Buffalo and White Oak Bayous. If the appropriate bacteria source components are not properly identified now during this study phase, the TMDL calculation process will be biased, and erroneous regulatory decisions may very well result. Given that this study is the basis for establishing new regulatory actions relating to point source discharge permits, it is prudent and essential that the basis for source identification and respective load calculations (load contributions and load reductions required) of wet weather flows be reliable and legally defensible. It is my opinion that some of the wet weather point source load calculations resulting from the BLEST tool, as defined in the final November 2006 BB/WOB TMDL report, will generate biased data that are suspect for regulatory actions and which may lead to faulty regulatory decisions. TCEQ has stated in several past BTMDL stakeholder meetings that this study will serve as the basis for setting other metropolitan bacteria TMDLs in the region. If the originating study is flawed, all subsequent studies based on the originating study will also inherit these flaws.	The Buffalo and Whiteoak Bayou TMDL project has completed to date one of the most detailed and thorough source identification and analysis in Texas, and probably nation-wide. A summary of what this TMDL has studied is provided in Appendix H. The bacteria loading from wet weather conditions is based upon an extensive dataset from the JTF where significant resources were expended to develop the bacteria dataset. The TMDL relies on the JTF data to quantify the wet weather load. The wet weather loading is based on JTF data. The bacteria load during wet weather is calculated using recorded annual rainfall amounts and the JTF EMCs. No specific recommendation or suggested changes are included in this comment thus no action was possible. See TCEQ responses #3 and #6 for a discussion of uncertainty and inpact on the community.

COMMENTS RELATED TO REGULATED STORM WATER DISCHARGES

Organization		Comments	Response
Pechacek	4	The BLEST tool is a spreadsheet calculator. It is used to estimate loads generated by the various identified sources in the spreadsheet, and also estimates the load reductions required. Its performance is directly related to the accuracy of the data inputs used to populate the spreadsheet. It does not model pollutant fate and transport, and can not look backwards and replicate historical water quality data. The spreadsheet only estimates loads for 3 flow scenarios, which are described as dry, intermediate and wet. Of particular interest is the wet flow scenario, defined as precipitation of 0.8 inches over 24 hours, which may be characterized as a steady drizzle over 24 hours (0.033 inches per hour). This diminutive storm event would result in a very small runoff volume, especially when compared to the geometry of the two bayous. See Photographs 1-2 for typical views of White Oak Bayou. In contrast, the City of Houston uses a 2-year, 24-hour (about 5.5 inches) design storm for sizing storm sewer collection systems.	See response to Harris County comment 12. The City of Houston design storm as noted by the stakeholder is specifically used for sizing storm water collection systems. The definition of a wet weather load in the TMDL is based on the 70th percentile from the flow duration curve for instream flows. The concept of a design storm as the one referenced in the comment is unrelated to observed instream flows under wet weather conditions from watershed areas for each segment.
		Although the use of the 3 discrete flow scenarios greatly simplifies the calculation process, it is difficult to understand how these three flow scenarios reflect the actual and real flow characteristics of the bayous. Storm events are episodic and acute, and exposure is limited, especially when compared to the dry weather flow regime, which predominates over the course of the year. But in this simplified 3 flow scenario spreadsheet, storm water is a component in two of these flow scenarios, i.e., intermediate and wet.	The use of the three flow conditions is intended to cover the entire range of the instream flow duration curve and to be representative of all flows in the bayou throughout a given year. The dry weather flow (< 30th percentile) reflects a condition when a flow in the bayou is predominately wastewater treatment effluent. The intermediate flow reflects the 30th to 70th percentile of the flow duration curve. The intermediate flow is calculated as the sum of wastewater effluent and an additional flow increment from runoff to makeup the median flow in the bayou (midpoint between the 30th and 70th). Wet weather condition (> 70th percentile) reflects the condition where the flow in the bayou is predominately from runoff due to rainfall. Figure 1 in Appendix D illustrates the three flow conditions and shows the effluent contribution during each of the three conditions.
		How appropriate and realistic is it for wet weather discharges, an episodic and acute flow regime that occurs in a limited fashion over the course of the year, to comprise two of the three flow scenarios?	See response to previous comment in the cell above. While it may be appropriate to characterize rainfall as "episodic and acute," the same is not true for flow in the stream. Flow in the stream responds to the rainfall time series and reflects the cumulative effects of these "episodic and acute" events. The pollutograph in the stream also reflects the stream flow time-series. By using the three flow conditions as is done in the TMDL, the full range of flows experienced in the bayou as a result of all these time-series type events is accounted for.

COMMENTS RELATED TO REGULATED STORM WATER DISCHARGES

Organization		Comments	Response
Pechacek	5	In regard to the nomenclature used to label the allocation tabs within the spreadsheet, the load allocation tab entitled "MS4s: is a misnomer. The tab should more appropriately be labeled 'NPDES/TPDES regulated discharges" to reflect the TMDL calculation and allocation process outlined in the November 2002 EPA memo entitled Establishing TMDL Wasteload Allocations for Storm Water Sources and NPDES Permit Requirements Based on those WLAs. The memo states that all NPDES-regulated storm water discharges must be addressed by the wasteload allocation component of a TMDL.	Noted. The tab name has been changed to Regulated Storm Water Discharges.
Pechacek	6	Such NPDES/TPDES-regulated discharges include TCEQ's construction general permit, TCEQ's draft phase 2 MS4 permit (Phase II MS4), TCEQ's industrial storm water general permit, and other industrial category storm water permits discharging into these two watersheds. The research team's Work Order No. 8, the Final Quarterly report dated January 23, 2006, and the November 2006 BB/WOB TMDL report do not acknowledge load contributions from the TCEQ storm water general permits, and seem to have inappropriately included those TCEQ general permit loads in the MS4 wasteload allocation value.	Noted. The tab name has been changed to Regulated Storm Water Discharges.
Pechacek	7	The study's silence regarding Phase II MS4 communities is curious and significant. There are also sizeable Phase II communities (Katy, Jersey Village, the Memorial Villages) discharging storm water runoff into the two watersheds, and these communities also have the potential to discharge pollutants, including bacteria, in their runoff. Phase I MS4 permits do not cover or authorize the discharge of other permitted flows through the MS4, and should not include the Phase II MS4 drainage areas, discharges or wasteload allocations.	All these areas are included in the calculations for runoff through the storm sewer network, which is now titled "Regulated Stormwater Discharges." The new terminology is used to avoid confusion. See TCEQ response #12 for a discussion of stormwater sources.
Pechacek	8	Thus, either the MS4 loads tab should be relabeled as "NPDES/TPDES-regulated storm water" loads with accompanying text acknowledging separate allocations for the general permits are to be determined at a later time, or the TCEQ-permitted loads should be estimated now and carved out from the MS4 wasteload allocation value. Not subtracting the TCEQ permitted loads out and instead mistakenly attributing them to MS4 permitted loads increases the wet weather loading error inherent in this study and may perpetuate faulty regulatory decisions.	Noted. The tab name has been changed to Regulated Storm Water Discharges. The text clarifies that the allocations are lumped for all permitted discharges within the study watersheds.

COMMENTS RELATED TO REGULATED STORM WATER DISCHARGES

Organization		Comments	Response
Pechacek	9 & 10	In Section 3.2, the report states that "The wasteload allocations of a TMDL include all bacteria sources regulated through environmental permitting." This statement is incorrect because the TPDES storm water general permits are environmental permits, and they are not identified, discussed or assigned a waste load allocation. This omission of TCEQ's storm water general permitted loads from inclusion under the waste-load allocation term of the TMDL study is a significant issue. TCEQ holds these general permits and is, by right, a stakeholder in the TMDL study and IP. The TCEQ storm water general permits should have their own wasteload allocation(s) and, given these allocation(s), TCEQ should rightfully share in the cost and effort to reduce loadings discharged under its storm water general permits.	The section has now been retitled and now reflects that all permits are included in the overall allocation.
TXDOT	2c	**Describe Flow Regime Selection Method:** The formulation of the intermediate and wet weather conditions should be more thoroughly described. Upon what basis was the median flow determined to be 10-20 MGD higher than the dry condition? The derivation of this range should be provided. Similarly, the selection of 0.8 inches over 24 hours as the peak of a typical Houston rainfall event for the wet weather condition should be explained in more detail. What rain gauge was used to determine this precipitation amount and what is the recurrence interval?	See response to Comment 12 from Harris County.
TXDOT	2i	**Make Distinctions Among Stormwater Point Source Loads**: Section 3.2.2. does not note the various types of stormwater point source discharges that could contribute bacteria loads. Under federal and state regulations certain industrial facilities, construction sites, and small, medium, and large municipal separate storm sewer systems are regulated point sources and should be included in this discussion. TxDOT believes that developing waste load allocations (WLA's) by stormwater discharge categories will lead to more cost effective implementation actions. This approach is also consistent with EPA's policy on the subject (3)	See response to comment 5 from Linda Pechacek.
TXDOT	2k	**Peak Flows Should be Documented In Section 3.2.2.2**: The discussion of wet weather flows simulated in BLEST should be supported by a table of peak flows.	Use of the term, "peak flow," has been eliminated from the document. See response to comment 6 from the City of Houston for an explanation of wet weather conditions.

COMMENTS RELATED TO REGULATED STORM WATER DISCHARGES

Organization	Comments		Response
TXDOT	2r	28. **Some Dry Weather Loads Are More Appropriately Handled in the Load Allocation: S**tormwater permitting regulations define certain "allowable non-stormwater discharges," such as lawn watering, foot drains with uncontaminated groundwater, and similar discharges. Recent studies by Harris County have illustrated that many of these allowable non-stormwater discharges actually contain elevated concentrations of indicator bacteria. Elevated levels appear because natural bacteria are added to sheet flows and stormwater flows across and through lawns and other areas with natural soils. Because MS4 operators cannot regulate or control bacteria loads in these "allowable stormwater dischargers" these bacteria loads should be considered part of the formal TMDL Load Allocation (LA) along with the oth4r uncontrollable nonpoint sources.	See response to comment 55 from Harris County in the DWSS response to comments document.
TXDOT	2r	We urge the TCEQ to explicitly quantify a bacteria load allocation to allowable stormwater discharges. Some fraction of the dry weather loads illustrated in Table 305 should be removed and placed in the LA. See related Comment(s).	See TCEQ response #14 for a discussion of this issue.

COMMENTS RELATED TO REGULATED STREAM BED SEDIMENT

Organization	Comments		Response
COH	13	In Section 3.3.2, the report assumes no sediment load during dry weather and intermediate conditions. This is unrealistic. Bacteria in sediment will leave and enter the water column in a very dynamic manner and the load under these conditions could be significant and should be considered.	It is acknowledged that bed sediment resuspension is a dynamic process that is being estimated using a basic approach that can predict average loading across the segments. Bed sediment loading rates were recalculated as described in Appendix E. Through this analysis, it was found that bacteria loading from sediment would occur only during extreme high flow conditions in Buffalo and upper Whiteoak Bayous. In the concrete lined portion of Whiteoak Bayou, relatively high velocities are maintained so that sediment build up would be prevented. Thus, the lower part of Whiteoak Bayou should have minimal resuspension, except for areas blocked by debris that slows down velocities.
HC	28	BLEST Spreadsheet Tab "BED" – Please clarify how Stream Width (Column C) was determined. The BLEST information sheet states that it was determined from GIS. Is it the width of water surface from aerial photo or the width of the channel? During a runoff event, when resuspension happens, the width of water surface is wider than that during base flow condition. Was this taken into account?	Stream width was estimated using digital elevation models (i.e., elevation information). The width was that of the bottom of the channel, not of the water surface. The bottom width of the channel was used because it is in constant contact with the shearing forces from the water. Side shearing was not evaluated.
HC	29	BLEST Spreadsheet Tab "BED" – The BLEST Model does not allow for settling. Is the resuspension rate here the net resuspension rate (resuspension rate minus settling rate)? Resuspension happens only in wet condition in the BLEST Model. Why isn't there bacterial loss due to settling in dry condition when the flow is slow? If there is no bacterial settling, from where are the bacteria in the sediment (source of resuspension)? Why is regrowth/die-off of bacteria in water column and sediment not included in the BLEST Model?	Resuspension rate is just that, a resuspension rate. Settling is included in the in-stream processes calculation. The discussion has been clarified to distinguish between the various rainfall amounts and their use in calculating the various sources. The BLEST spreadsheet also now includes a net value representing regrowth, die-off and settling in addition to resuspension. See additional information in response to Comment 2a from TXDOT in the WWTP section and Appendix F.
HC	30	BLEST Spreadsheet Tab "BED" – A value of 5% was assigned to *Portion of Storm Experience Shear > Tc* (B18). The BLEST information sheet says it is an assumption based on achieving reasonable amount of sediment resuspension. What is the "reasonable amount of sediment resuspension here"?	A reasonable amount of resuspension was determined based upon matching in-stream concentrations of bacteria at the four segments.

COMMENTS RELATED TO REGULATED STREAM BED SEDIMENT

Organization	Comments		Response
HC	31	BLEST Spreadsheet Tab "BED" – Can the resuspension rate taken from another system (Swan Creek) directly be used for Buffalo Bayou without any experimental comparison? If it is used, why not use the average of the three resuspension rates from the experiments, instead of one of them? It may also not be suitable to use a constant resuspension rate for all the locations along Buffalo Bayou and for all storm events.	The average of the three measured rates (11,400 MPN/m2/s) was used to calculate sediment loading in BLEST.
HC	32	BLEST Spreadsheet Tab "BED" – The equation to calculate Resuspension Rate Per Storm (B25) is not clear in the BLEST Information Sheet. It seems that the BLEST Model assumes that the number of rain days per year is 74 and there is one rain event on each of these days. It may not be true because there may be more that one rain event on a day or one rain event may cross more than one day	See response to comment 6 from City of Houston and response to comment 12 from Harris County in the regulated stormwater discharge section.
HC	83	On Page 60, the Report states that "the experimentally determined resuspension rates of *E. coli* in a small stream determined by Jamieson *et al.* (2005) were used". Many factors affect the resuspension rate, e.g. geometry and hydraulic properties of the channel, shape, size and material of sediment particles, bacteria concentration in the sediment, etc. It may not be accurate to use the rate obtained from experiments in a small stream to represent the rate in Buffalo and White Oak Bayous.	Data regarding bacteria resuspension are limited, thus literature rates were used.
HC	84	In Jamieson *et al.* (2005), the critical conditions for resuspension, as well as resuspension rates, of sediment-associated bacteria were determined for three storm events in a small stream. The resuspension rate of 8,200 cfu/m^2/s adopted in the BLEST Model (Pg 60 *Final Report*) is one of the three experimentally determined resuspension rates. The other two are 11,000 and 15,000 cfu/m^2/s. The resuspension rate is a function of a number of hydraulic conditions (e.g. flow speed, geometry of the channel, and characteristics of the sediment particles, etc.). Why were the rates determined in another stream used in Buffalo Bayou directly? Is there any investigation on the resuspension rates specific to different portions of Buffalo Bayou (different portions may have different channel slope, Manning's *n*-value, cross-sectional area, and other channel geometry which would generate different resuspension rate)? Note the resuspension rates in the same channel also vary during different storm events due to the difference in flow.	Based on comment 31 from Harris County, the average of the three resuspension rates is now used. It is important to note that BLEST is intended to represent a typical year for four individual stream segments, not a particular storm event for particular locations in the bayou. Therefore, BLEST incorporates characteristics that are representative of the study segments, such as depth, rainfall amount, etc. Individual instream properties for reaches are not used since the tool represents average conditions of the segment.
		How can a single resuspension rate be used in the BLEST for the entirety of Buffalo Bayou and for different storm events? A much better approach would involve empirical measurements. Jamieson et al. (2005) STATES ON Page 588 "simulating bacteria resuspension directly as a function of hydraulic conditions (flow, bed shear stress) will remain the only practical approach". Why not use a function of hydraulic conditions and the measured specific hydraulic conditions for Buffalo Bayou to estimate the resuspension rates? Secondly, if the rates from the 19-b study are adopted, why not use the average of the three experimentally determined rates instead of the lowest one of the three?	The average of the three measured rates (11,400 MPN/m2/s) was used to calculate sediment loading in BLEST. Again the tool is a mass balance approach on a daily basis and is not intended to represent single storms or single events.

COMMENTS RELATED TO REGULATED STREAM BED SEDIMENT

Organization	Comments		Response
HC	85	The experimental work in Jamieson *et al.* (2005) found that bacteria resuspension primarily appeared during the rising limb of storm hydrographs. There is no information supporting the basis for the statement on Page 61 of the Report that "it was assumed that during the peak conditions, which was assumed to occur during only 5% of the storm, would sediment resuspension occur".	Noted. The period of resuspension is now calculated using in-stream flow data measured at USGS gages. See response to comment 13 from the City of Houston. Supporting information on flows that would be expected to support resupsension are found in Appendix E.
HC	86	In Page 60, please clarify how typical velocities that cause stream bed erosion (reported in literature) correlate with dry/intermediate/wet flow conditions in Buffalo and White Oak Bayous.	An analysis of these conditions was undertaken and is presented in Appendix E. The analysis of the observed flows suggests that bayou flows exceed the resuspension flows in wet weather conditions 1 to 5% of the time, thus these percentages were used.
HC	87	On Page 61, it is stated that "It was assumed that during the peak conditions, which was assumed to occur during only 5% of the storm, would sediment resuspension occur." Please provide the basis of this assumption. The occurrence of sediment resuspension is a function of many factors. This assumption does not reflect those factors which determine the occurrence of resuspension. It is assumed that resuspension only occurs in wet weather for allocation calculations?	See response to Harris County comment number 86.
HC	88	Page 61 if the Report states that although concreted portions of White Oak Bayou are assumed to "…transmit (sic) suspended sediments from the upeer *(sic)* watershed downstream", there is no additional *E coli* loading from these sediments. Please explain the reasoning behind this.	See response to comment 13 from City of Houston.
HC	89	Resuspension is a function of many factors. Using a constant resuspension rate of 8,200 cfu/m^2/s (Page 60) for all reaches is inappropriate. A constant resuspension rate would result in a greater bacterial load for a reach with greater area (Length X width), as the statement of "As the loading is a function of stream width and length, the streams with the largest stream surface area exposed to bed sediment will consequently have the largest bed sediment contribution" on Page 61. This statement could be not true because a wider reach may have a slower flow velocity and a smaller resuspension rate.	See response to Harris County comment number 84.

COMMENTS RELATED TO REGULATED STREAM BED SEDIMENT

Organization	Comments		Response
HC	90	On Page 60, the Report states, "…the experimentally determined resuspension rates of *E. coli* in a small stream determined by Jamieson et al. were used." Many factors affect the resuspension rate, e.g. geometry and hydraulic properties of the channel, shape, size and material of sediment particles, bacteria concentration in the sediment, etc. It may not accurate to use the rate obtained from experiments in a small stream to represent the rate in Buffalo Bayou. On Page 61, the Report states, "As the loading is a function of stream width and length, the streams with the largest stream surface area exposed to bed sediment will consequently have the largest bed sediment contribution." Does this reflect reality? Resuspension is a function of many factors. For a wider channel, the velocity of the flow could be slowed down, and there is a tendency of settling rather than resuspension in the low velocity flow zone.	See response to Harris County comment number 84.
HC	91	Why are re-growth and die-off not considered in calculating the bacterial loads from resuspension? Why doesn't the spreadsheet consider any in-stream kinetics of sediment settling and bacterial growth?	See response to Harris County comment number 29.
HC	92	Resuspension of *E. coli* from the bed sediments is not totally dependent upon scour from rainfall events. Limited data has been collected to demonstrate significant regrowth of *E. coli* in warm, nutrient rich waters. Visual observation of small wastewater treatment plants outfalls has noted small sludge banks where limited samples have shown high *E. coli* numbers. *E. coli* is a facultative anaerobe capable of producing gas bubbles which rise with bacteria attached and also contribute to the *E. coli* concentrations observed in the water column. In addition, resuspension may also occur as a result of bird or animal activity within the stream channel. Wading birds particularly will stir up sediment and potentially result in resuspension of bacteria during dry weather conditions as will ducks and fish feeding on the bottom.	Noted.
HC	93	The calculations for Table 3.20 on page 62 assume that all sediment is inoculated and grows at the same rate. Without some sampling data, there is no basis for these numbers at all.	See TCEQ response #11 for a discussion of this issue.
Pechacek	15	At the February 7, 2007 Bacteria TMDL stakeholders meeting, information was presented from a local agency about a significant study conducted by NSF International evaluating bacteria regrowth in WWTP effluent. The study found much, much greater levels of bacteria regrowth than that TMDL research team determined from its small-scale experiment conducted early in the TMDL study. It appears that an empirical equation based on this small scale pilot experiment is being used in the BLEST calculator tool to determine the resuspension (bacteria regrowth) load. Can the data generated by TMDL research team's resuspension equation hold up to critical review? The NSF International study brings into question whether the resuspension data calculated in the spreadsheet is reliable and reproducible. Since White Oak Bayou is primarily an effluent dominated stream, this large spread in the resuspension regrowth results is disturbing. The public expects data used in a regulatory process to be reproducible, i.e., legally defensible, not experimental.	The experiments undertaken by National Sanitation Foundation (NSF) are very different from those undertaken in this study, and are not directly comparable.

COMMENTS RELATED TO REGULATED STREAM BED SEDIMENT

Organization	Comments		Response
TXDOT	2t	30. **Dry Weather Sediment-bound Loads Under-Estimated:** In Section 3.3.2 the assumption of no sediment-bound load during dry and intermediate conditions is unrealistic Bacteria in sediment will leave and enter the water column in a very dynamic manner and the significant sediment loads under these conditions should be considered. The selection of the lowest resuspension rate found by Jamieson et al. (2005) should also be explained. Due to the uncertainty associated with applying the data to both watersheds, the average resuspension rate should be utilized to factor in the erodibility of the various soils traversed by both streams. Additionally, the assumption of sediment resuspension, during only the peak conditions (which comprise 5% of flow conditions) does not appear justified. Are data available to support this assumption?	In response to previous comments, the occurrence of resuspension in the stream was recalculated using measured velocities. See response to comment 13 from City of Houston and response to Harris County Comment 84 regarding average resuspension rates.

COMMENTS RELATED TO WASTE WATER TREATMENT PLANT DISCHARGES

Organization	Comments		Response
COH	7	Section 3.2.1 states that wastewater treatment plant discharges “have the potential to make up a large portion of the bacteria load because of their nature.” This statement is not explained or justified.	This statement was removed from the report.
HC	11a	Harris County supports the 3-Tier Flow approach as a means of separating the issues to be addressed. However, the definition of what constitutes dry and wet weather flows is inconsistent, and needs to be clarified. It would also be helpful to know the source of the assumption that biosolids releases may occur with a 0.5 inch rainfall. We contend that biosolids releases occur on a continual basis as each of the wastewater treatment plants are authorized to release suspended solids at some level in the effluent. Quantification of the term “biosolids releases” would be helpful.	See response to comment 11 from Harris County in the "Regulated Stormwater Discharge Section" for explanation of the wet weather condition. The term biosolids was defined in detail in the Work Order 8 Final report: "Biosolids are the by-product of sewage sludge that has been treated and thus can be beneficially reused. Releases of sludge or biosolids can occur during high flow events if wastewater treatment facilities are not managing solids levels or if the inflows into the plants are extremely large. There are anecdotal reports from local TCEQ field inspectors of deliberate wasting of solids under normal flows, presumably to avoid the cost of biosolids processing and disposal." This does not include the TSS releases authorized under permits. See response to Harris County Comment 22 in Regulated Stormwater Discharges for an explanation of the 0.5 inches of rainfall.
HC	16	Based on Page 13 of the Report, the Wet Load (Column H) in the spreadsheet is actually Intermediate Load, and Wet Flow (Column D) is actually Intermediate Flow. Column D should be: Intermediate Flow = Dry Flow * 0.2535* (Rain)^1.1493 + Dry Flow, where Rain = 0.25 inch. The term “+ Dry Flow” is missed in the equation, which causes “Intermediate Flow”< “Dry Flow” in the spreadsheet. The value of wet flow in the spreadsheet is only the incremental flow above dry flow.	The column was renamed "Additional Incremental flow during intermediate conditions" to avoid confusion.
HC	17	In the BLEST Model, Wet Load = Intermediate Load + Biosolid Load, where: a. Intermediate Load = Bacterial Dry Weather Concentration * Intermediate Flow (it is assumed that Intermediate Weather Concentration = Dry Weather Concentration, Page 13 of the November 2006 Report); b. Biosolid Load = Bacterial Concentration of stream sample near biosolid release * the incremental flow above the intermediate flow. (Page 17 of the Report). The Bacterial Concentration of stream sample near biosolid release is not the concentration only for the incremental flow above the intermediate flow. Rather it is the concentration of bacteria in the total flow, including the contributions from both the effluent and the biosolid. We recommend: Wet Load = Bacterial Concentration of stream sample near biosolid release* Total Wet Flow, where Total Wet Flow = Dry flow * 0.2535* (biosolidRain)^1.1493+Dry flow (biosolidRain = 0.5 inch).	Noted. The interpretation listed in the comment by Harris County is not entirely correct. The following corrects the formulas to the left. a. Intermediate Load = Dry weather load + Bacteria Dry Weather Concentration * Incremental Intermediate Flow; b. Biosolid Load = Bacterial Concentration of stream sample near biosolid release * the incremental flow above the intermediate flow. The suggested equation for wet load is not used because the load being calculated is the incremental load from biosolid releases during rain events. This incremental load is added to the dry weather load and the intermediate load from WWTPs to calculate the total load from this source when flows in the bayou are above the 70th percentile.

COMMENTS RELATED TO WASTE WATER TREATMENT PLANT DISCHARGES

Organization	Comments		Response
		Second, is the assumption that Intermediate Weather Concentration = Dry Weather Concentration based on any observed data?	The intermediate condition refers to flow in the bayou. Under this condition, flows from WWTP were incremented to reflect the effects of rainfall on WWTP flows but not concentrations. Thus, under the intermediate instream flow condition scenario, wastewater treatment plants have flows that exceed their 5-year self-reported average. In Work Order 8, there is some limited data that demonstrate a short, but not sustained, increase in WWTP bacteria concentrations after a rainfall event (See Figure 4.3 in Final Report for Work Order 8).
HC	18	Page 13 of the Report states, "Intermediate condition events are considered those when rainfall is between 0.25 and 0.5 inches of rainfall per day". In calculating the intermediate flow, a value of 0.25 inch was used in the spreadsheet. Why the lower limit of the intermediate condition was used? Why not use 0.375 inch (median of 0.25 and 0.5)? What's the scientific/statistical basis of the Intermediate (0.25-0.5 inch rainfall) and Wet (>0.5 inch rainfall) conditions?	See response to comment 22 in the Regulated Stormwater Responses from Harris County for discussion on this topic.
HC	19	Page 17 of the Report states, "Biosolid releases were assumed to occur when rainfall in previous 12 hours was greater than 0.5 inches". In calculating the intermediate flow, a value of 0.5 inch was used in the spreadsheet. Why the lower limit of the wet condition was used? Is there any statistical analysis to see the distribution of rain fall volume greater than 0.5 inch?	See response to comment 22 in the Regulated Stormwater Responses from Harris County for discussion on this topic.
		For intermediate flow, why is the condition 0.25 – 0.5 inches of rainfall per day (e.g. 24 hr) (Page 13), while for wet flow, the condition is rainfall in the previous 12 hours (Page 17) was great than 0.5 inches. For example, if there is a rainfall event which has an intensity of 0.025 inches per hour over 24 hours. The total volume of the rain fall is 0.6 inches (0.025*24) in a day (e.g. above the intermediate condition) but has a volume of 0.3 inches in the previous 12 hours? Is it an intermediate flow or wet flow weather?	Calculating the incremental loads during the instream intermediate and wet weather flow conditions is based on the 0.25 inches and 0.5 inches, respectively. Time does not enter into this calculation. The 0.25 inches and the 0.5 inches of rainfall are used to estimate the additional daily loads from wastewater treatment plants during instream intermediate and wet weather flows, respectively. It is noted that the 0.25 and 0.5 inches do not represent specific storm events but are used to calculate the incremental amount of flow that would be associated with additional bacteria loads from WWTPs on rainy days.
HC	20	BLEST Spreadsheet Tab: "Median Wet MS4" – In calculating the Wet Flow and Wet Load for WWTPs, a rainfall of 0.5 inches is used (see Tab WWTP), while here a rainfall of 0.8 inches is used to calculate the Wet Flow and Wet Load from runoff. Why does the same Wet Weather Condition use a different rainfall volume?	See response to comment 12 from Harris County in the Regulated Storomwater Discharge Section for a discussion on wet weather.

COMMENTS RELATED TO WASTE WATER TREATMENT PLANT DISCHARGES

Organization	Comments		Response
HC	45	Provide supporting data for WWTP loads discussed on pages 7 through 9. Were samples collected only during dry weather conditions? Provide information on the influence of wet weather conditions on self-reported flows. Please clarify how the peak and off-peak loads were averaged, and how the geometric mean was applied for plants not sampled. For bacteria concentration values include any information on correlations/conversions made for fecal coliform and *E. coli* .	Information on the sampling conducted to develop loads discussed on pages 7 through 9 can be found in the Final Report for Work Order 2. The samples were conducted during dry weather only. Peak and off-peak samples were averaged together for each plant. If a plant was not sampled, it was assigned the geometric mean concentrations for peak and off-peak for each watershed. *E. coli* versus fecal coliform correlations were presented in Figure 4.3 of Work Order 2. Other correlations made with TSS, Residual chlorine, ammonia, and ortho-phosphorous can be found in Figure 4.4 through 4.7. No conversions were made.
HC	46	Page 9 refers to estimates taken from data collected in 2001. that data was the subject of numerous criticisms, so that the Project Team re-collected WWTP data in the summer of 2006. Harris County also conducted a similar study in the summer of 2006. Why is the 2001 data the only data herein considered?	The report on which comments are being made was submitted in draft form in September 2006 and finalized in November of 2006. The WWTP sampling data collected by TCEQ was collected between June and August 2006, with data validation and quality assurance undertaken immediately after that (September through November 2006). Thus, these data were not available for inclusion. In addition, the Harris County data were not made available to the project team until early 2007 in preparation for the February 2007 stakeholder meeting. The second quarterly report for FY2007 incorporated and compared the loading calculations using both sets of data from the TCEQ and Harris County. BLEST was updated in the summer of 2007 with the with TCEQ summer 2006 data to estimate dry weather loads since they sampled most WWTPs in both watersheds while Harris County sampled only a few plants in the Whiteoak Bayou watershed.
HC	47	On Page 9, the report states that “the monthly self-reported flows were averaged to determine a daily flow as shown in Table 3.1”. These averaged self-reported flows were then used to calculate E. coli load during dry weather conditions. Please clarify how the self-reported flows were treated for the individual plants and subwatersheds.	The individual self-reported flows for each plant were presented in the Final Report for Work Order 8 in Appendix G. The arithmetic mean was taken of flows between April 1999 through October 2003. Plants were assigned by subwatershed as shown in Tables 9.4 and 9.5 of the Work Order 8 Final Report and flows from individual plants were totaled by subwatershed.
HC	48	On page 13, the report states that “The concentration associated with WWTP discharges during the intermediate conditions were assumed to be the same as those under dry weather conditions”. Is the assumption based on observation or literature data?	Please see response to Comment 17 from Harris County.

COMMENTS RELATED TO WASTE WATER TREATMENT PLANT DISCHARGES

Organization	Comments		Response
HC	49	What is the basis (observation or literature data) for the statement on page 13 that "Rainfall greater than 0.5 inches represents conditions under which biosolids releases may occur.', and on page 17 that, "Biosolid releases were assumed to occur when rainfall in the previous 12 hours was greater than 0.5 inches"? By at least one of the definitions discussed earlier this would appear to be intermediate flow, yet the text states that the concentrations for intermediate and dry weather flows were the same as noted in 23 above.	Please see response to Comment 19 from Harris County
HC	50	It is stated on Page 17 of the Report that "Anecdotal evidence and observations at WWTPs has demonstrated that occasionally during large rainfall events, biosolids releases may occur from plants that are carrying a solids blanket" and "biosolid releases were assumed to occur only during wet weather". If this means that a rainfall in the previous 12 hours greater than 0.5 inches represents wet weather, it is not equivalent to the definition of wet weather on Page 5, which defines wet weather as "precipitation of 0.8 inches over 24 hours". Consistent terms and definitions should be used throughout the document.	Noted. The language has been clarified throughout the document.
HC	51	On Page 17, Report states that Houston has 74 days of precipitation out of the year. How many of the 74 days of precipitation were greater than 0.5 inch? Only those days with a precipitation greater than 0.5 inch in the previous 12 hours should be included in the assumption of the occurrence of biosolid release.	See response to comment 22 in the Regulated Stormwater Responses from Harris County for discussion on this topic.
HC	52	When analyzing direct fecal contaminants such as biosolids (Page 17), it is inappropriate to use an EC/FC ratio adjustment in the absence of empirical measures. In fecal samples the FC/EC ratio is so close to 1 that no adjustment is needed. This means that the biosolids *E. coli* numbers are artificially low by 37%.	The conversion factor is the ratio of standards used by EPA and TCEQ. This conversion factor is used because there is no satisfactory analytical starategy to establish a value under all conditions. If E. coli data were available, they would be used and no conversion would be necessary.
HC	53	The bacteria loads from WWTPs under dry, intermediate, wet weather were calculated separately (shown in Table 3.4). The final calculated loads are on a daily basis (in a unit of MPN/day) not on a yearly basis. It seems that the adjustment of the daily biosolid load in order to account for 74 days of precipitation per year is unnecessary. This adjustment would underestimate the load on a wet weather day.	The statement in the report has been removed.
Jensen	3	Table 3.4 WWTP loads—It would be helpful to include concentrations in the table so that the reader could easily track the computations. The load values by themselves are relevant only in relation to loads from other sources.	Noted. The table is, however, a summary of loading, and thus concentrations are not relevant.
TXDOT	2a	**Regrowth Not Considered in Loads: Tables 3.26 (A) through (D) do not include any Regrowth factors, yet literature and studies conducted by Harris County suggest that in tropical climates and effluent dominated streams regrowth can explain a large fraction of the observed concentration of bacterial indicators.** During the February 8, 2007 stakeholder meeting TCEQ's contractor added a regrowth factor to the spreadsheet, but also added a die-off factor. The die-off factor failed to recognize that the regrowth rates were "net" rates. Regrowth, die-off and the lack of settling are all complex processes that are not well quantified in the system.	Regrowth was evaluated and presented at the February 2007 stakeholder meeting using data from studies conducted by Harris County. Rates used for the stakeholder meeting were 2 per hour. The Harris County studies did not take into account settling and die-off. In response to this comment, the prior studies conducted by the project team indicate that the average rate representative of instream processes (regrowth, die-off, settling) was negative 1.5 per day, indicating overall declines rather than loading. This net regrowth/settling/die-off rate has now been implemented into BLEST. See Table 1 in Appendix F for a summary of the data used to develop the average rate.

COMMENTS RELATED TO WASTE WATER TREATMENT PLANT DISCHARGES

Organization	Comments		Response
TXDOT	2e	**Describe Selection of Rainfall Depths:** In Section 3.2.1.1. intermediate condition events are selected as those when rainfall is between 0.25 to 0.5 inches of rainfall per day and biosolid releases are considered to occur when rainfall exceeds 0.5 inches. How were these rainfall amounts selected? An explanation should be presented based upon rainfall, flow, and WWTP data collected within the watersheds.	See response to comment 22 from Harris County in the regulated stormwater discharges.
TXDOT	2f	**Evaluate Assumption of Equal Concentrations**: What impact does the assumption of equal concentrations associated with WWTP discharges during intermediate and dry weather conditions have on uncertainty? A sensitivity analysis should be performed to evaluate this assumption.	Noted. Data from four City of Houston WWTPs indicated increased flows during and subsequent to rainfall events. This incremental flow is much smaller than the flows coming in from runoff on the intermediate flow days in the stream, and thus its impact is relatively small.
TXDOT	2g	**Use Correct Criteria Ratio:** In Section 3.2.1.2. the 4,416 cfu/dl FC and the 2,612 MPN/dl EC ratio is 1.69. the report states that the conversion was based on the ratio of the two bacteria standards, which should be 200/126 = 1.59. The 1.69 ratio is inconsistent with the 1.59 ratio that should have been used.	Noted. The formula was changed to reflect the appropriate ratio.
TXDOT	2h	**Strengthen Basis of Biosolids Load Calculations**: The justification and verification of the biosolid load calculations should be strengthened by more than simply the application of anecdotal and occasional observations to the assumption of rainfall induced load by al biosolid releases at the subbasin level. It would be helpful to include concentrations in Table 3.4 so that the reader could easily track the computations. The load values by themselves are relevant only in relation to loads from other sources.	Noted. Observations at WWTPs on a daily basis were undertaken and described in the Final Report of Work Order 8. During this daily monitoring, several rainfall events occurred, with rainfall totals ranging from 0.55 in to 0.80 in. A dark substance was noted in plant discharge from several of the plants after 0.55 inches of precipitation. Table 3.4 is a comparative load analysis and is not related to concentrations in effluent.

COMMENTS RELATED TO DRY WEATHER STORM SEWER DISCHARGES

Organization	Comments		Response
HC	54	Please include a statement that submerged outfalls were not included in this analysis.	Noted.
HC	55	Stormwater permitting regulations define certain "allowable non-stormwater discharges", such as lawn watering, foot drains with uncontaminated groundwater, and similar discharges. Recent studies by Harris County have illustrated that many of these allowable non-stormwater discharges actually contain elevated concentrations of indicator bacteria. Elevated levels appear because natural bacteria are added to sheet flows and stormwater flows across and through lawns and other areas with natural soils. Since MS4 operators cannot regulate or control bacteria loads in these allowable non-stormwater discharges these bacteria loads should be considered part of the formal TMDL Load Allocation (LA) along with the other uncontrollable nonpoint sources. Some fraction of the dry weather loads illustrated in Table 3.5 should be removed and placed in the LA.	EPA considers all end of pipe discharges to be part of WLA. The estimate of dry weather discharges does not specify the origin. However, samples with high chlorine levels (i.e., levels greater than 2 mg/L) were eliminated from the dataset used to develop the load estimates.
COH	11b	In addition, the dry-weather storm sewer discharges shown in Table 3.15 have small flows but high EC loads, indicating the use of a high EC concentration (>11,000 MPN/dl), while the geometric mean of the MS4 sampling data presented in the Excel file is only 3.6.5 MPN/dl. Given that the dry-weather storm sewer discharges dominate the MS4 loads, these calculations need to be verified and calibrated.	All dry weather storm sewer discharge loads are based on measured data. Details of the sampling can be found in Work Order #2 Final Progress Report, January 2003
TXDOT	2q	27. **Inappropriate Bacteria Concentration Value Used to Estimated Dry Weather MS4 Loads:** The dry-weather storm sewer discharges shown in Table 3.15 have small flows but high bacteria loads. Based on the mathematics, it appears that a fairly high bacteria concentration (>11,000 MPN/dl) was used to develop the loading estimates This is not consistent with the geometric mean of the MS4 sampling data presented in the BLEST reference sheets, which reports only 306.5 MPN/dl. Because the dry-weather storm sewer discharges dominate the MS4 loads, these calculations should be verified.	See the response to City of Houston Comment 11b above.
TXDOT	2x	34. **Some Dry Weather Loads Are More Appropriately Handled in the Load Allocations:** Table 3.26 suggests that all waste load allocation sources, including dry MS4 loads, must be 100% reduced. Is this possible without prohibiting homeowners from watering their lawns in order to achieve the TMDL goals? The table illustrates that some portion of the current dry weather WLA should be considered part of the dry weather load allocation (LA). See related Comment (m).	See the response to Harris County Comment 55 above.

COMMENTS RELATED TO GENERAL TOPICS

Organization	Comments		Response
COH	1	The introduction should clearly outline the goal of the TMDL process. Readers must understand the implication inherent in the use designation of these urban bayous. "Contract recreation," as used in this report assumes full head immersion swimming. The TCEQ target criterion was developed from surveys in Oklahoma and New York of swimmers at fresh water lakes that had wastewater sources nearby. Those studies were done in the last 1970s and have not been updated. These historical studies also do not reflect the flow conditions, soil conditions, or subtropical climate of the Houston metropolitan area. The readers should be informed that a criterion for for "non-contact" recreation is also considered in the report.	Noted. The November 2006 report is a project final report for Fiscal Year 2006, not a TMDL Report. The requested material will be included in the TMDL document to the extent that it might be relevant to the discussion. The calculations in the project present the reductions needed to meet the non-contact recreation standard for illustration purposes. The current standard, however, for the Buffalo and Whiteoak Bayou TMDL is the contact recreation standard. The TMDL document will only include the calculations for the contact recreation standard.
COH	2	The work order descriptions could be strengthened through a table, list or bulleted format that conveys the sequence and details of the work, including status of each task.	Noted. Please see Table 1 in Appendix G.
	Chapter 2 – Stakeholder/Public Education and Involvement		
COH	3	This section should detail all stakeholder involvement, not just involvement by the University of Houston., Also, the report does not include a stakeholder meeting held on September 7, 2006.	The November 2006 report is a project final report for Fiscal Year 2006, not a TMDL Report. Since it is a final report, it only covers up to August 31, 2006 and does not include any meetings after that date. The September 7, 2006 meeting, was discussed in the first quarterly report for Fiscal Year 2007. Stakeholder participation will be discussed in more detail in the TMDL document. (See Appendix H outlining background and summary of the TMDL project).
	Chapter 3 – Bacteria Load Estimator Spreadsheet Tool		
COH	4	During the final development of the waste load and load allocation, the HSPF model that had been developed to simulate waste loading was abandoned in lieu of the BLEST approach. The report should include a thorough explanation of why this model was abandoned. It is also unclear whether this spreadsheet tool simulates the fate and transport of bacteria as the model was attempting to perform. Also, it appears that several inputs into BLEST are outputs from the HSPF model. The report should clarify which inputs are based on work from the previous modeling.	The HSPF model is still a part of the loading analysis. The development of the HSPF model began in fiscal year 2002 and the model was updated and revised at least twice to reflect new information obtained in the project. For example, in the first revision and based on stakeholder comments, the entire period of the model was changed to a more current period that had E. coli data rather than fecal coliform data. Another major change involved adding the reservoir watersheds explicitly. One of the key results of the modeling was that major reductions in runoff loads would be required to meet standards. During the latter part of 2005, the stakeholders and particularly the JTF expressed concerns about the HSPF model and its results via two memos sent to Ron Stein. In response to these concerns, the project team launched the development of the BLEST-mass balance approach that could be used in concert with HSPF to develop reduction strategies for managing bacteria loads. The TMDL project is using three approaches: Load duration curves, mass balance and HSPF to calculate reductions and load allocations.

COMMENTS RELATED TO GENERAL TOPICS

Organization	Comments		Response
			In the August 2005 stakeholder meeting, a comparative analysis of the model result from load duration, HSPF and BLEST all indicated similar load reductions were required. As of this writing, the HSPF model is being further updated to reflect this set of stakeholder comments. Prior to receiving these sets of comments from the stakeholders, no inputs into BLEST were outputs from HSPF or vice versa. However, and in response to this set of stakeholder comments, flow data from HSPF are now used for segments where no flow gages are available at the mouth of the segments. For instance, the mouth of Segment 1014 now uses HSPF flow time series in generating the 0-30th, 30-70th and greater than 70th flows. See response to Harris County Comment 24 in the Regulated Stormwater Discharges section.
COH	5	Section 3.2 clearly states that the TMDL includes all bacteria sources regulated through environmental permitting. However, the waste load allocations do not appear to account for loading from permitted activities other than the wastewater treatment plant discharges and MS4 discharges. The other permitted discharges, such as Phase II, MSGP, and Construction General, could be a contributing source of bacteria that is unaccounted for in the waste load and identified reductions.	The MS4 designation in BLEST was retitled to be regulated stormwater discharges. The entire watershed area was used to estimate the runoff load under the wet weather instream flow condition.
HC	3	The current view of bacteria as a non-changing, static pollutant is flawed, which unfeasible and untenable results. Since bacteria dies or grows in large part according to available food supply i.e. nutrients, it is only reasonable to address nutrient reductions as a part of this TMDL (see comment #20 for fuller explanation).	See TCEQ response #10 for a discussion of this issue.
HC	4	Harris County does not believe a TMDL with as much uncertainty as this one should be adopted at this time. We believe that implementation should begin on known problems, while the actual inputs into the TMDL model are further refined	See TCEQ response #6 for a discussion of this issue.
	Introduction		
HC	5	Work Orders 1, 2, 5, 6 & 8 are summarized on page 1. What of Work Orders 3, 4 and 7?	Work Orders 3, 4 and 7 were other contracts not related to Buffalo and Whiteoak Bayous.
HC	6	Page 1 states that a "…water quality model was developed as a part of Work Order." Which Work Order?	A water quality model was developed as a part of Work Order 2. This has been modified in the text.

COMMENTS RELATED TO GENERAL TOPICS

Organization	Comments		Response
HC	13	Reportedly, TCEQ's three-tiered flow approach was based on the approach used for Kansas TMDLs, which is described in A Simple Method to Define Bacteria TMDLs in Kansas. The Kansas Approach used a flow duration analysis, which calculates the cumulative frequency of the historic daily flow data over a period of time. The product of this analysis is a curve relating flow values to the percent of time those values have been met or exceeded. The flow duration curve is then converted to a load duration curve by multiplying the flow values along the curve by the applicable numeric water quality criteria.	LDCs were developed and presented at the stakeholder meeting on February 6 2007. See the handouts from the stakeholder meeting in Appendix H.
HC		Four USGS stations along Buffalo Bayou at Dairy Ashford, West Beltway 8, Piney Point and Shepherd have a long period of flow records. These stations also have water quality data including fecal coliform. In the Buffalo and White Oak Bayou report, there don't appear to be any flow duration analysis and subsequent load duration analysis using the historic flow records at any gauging stations, as well as the resultant flow and load duration curves. We request that these analyses be included to increase the robustness of this approach.	
HC	15	Second paragraph of Page 4 of the Report provides a partial listing of allocation sources. Please provide a full list.	Noted. However, this is a progress report for the fiscal year and not a TMDL document. The requested information will be provided in the TMDL document.
HC	33	Tasks in WO 8 are described as "completing source data collection, as well as refining and developing load allocation methodologies." Abandoning the HSPF model and developing the BLEST Model seems like starting completely over, without adequate discussion and review. Stakeholders have been unable to use the BLEST Model to verify how it works.	See response to City of Houston Comment 4. The BLEST model has been revised to facilitate its use by stakeholders.
HC	34	What is the origin/development/application history of the Bacteria Load Estimator Spreadsheet Tool (BLEST)? Is this an EPA-approved approach? Where has the BLEST approach been used for a bacteria TMDL?	See response to City of Houston Comment 4. The BLEST tool is similar to EPA's Bacteria Indicator Tool in that it estimates loads from a variety of sources, but is much more customized for the project watersheds and does not require input into another model.
HC	35	Is there any calibration and verification process for the BLEST Model to compare these calculated loads with the observed data? The BLEST calculated loads from various sources under three conditions (wet, intermediate and dry). Without calibration and verification, how can it be ensured that the Model reflects reality? Is there any uncertainty analysis on the Mode results?	Yes, two different calibration/validation approaches have been used and are presented in Appendix G. The calculated loads from BLEST are compared to the ranges of observed in-stream loads in the first calibration/validation approach (calibrated scenario). In the second approach, however, the BLEST loads are calculated to match the median instream loads for each flow range at the mouth of each segment. The reductions for both approaches are for all practical purposes almost the same and are furthermore consistent with the HSPF model and LDC approaches.

COMMENTS RELATED TO GENERAL TOPICS

Organization	Comments		Response
HC	37	The Report states on Page 75, "…very large reductions are required in the bacteria loads to meet contact recreation standards under dry weather conditions with percent reduction for waste load allocation sources greater than 99% for all segments. Required reductions for load allocation sources range from 87% to 100% under dry condition, 99% to 100% for waste load source reduction for intermediate conditions, and greater than 98% for both waste and load allocation sources under wet conditions". Based on the data presented in Table 3.26 A-D (page 76-79), in order to meet the contact recreation target, a 100% or nearly 100% reduction is required for most segments under most conditions (dry, intermediate and wet). That means the background = the standard.	Noted. No response required.
HC	38	The Model often used average/geometric mean values to estimate loading. Due to the huge range of observed bacteria concentration, the uncertainty associated with these average/geometric mean could be significant. However, there is no analysis on the uncertainty associated with the use of geometric mean/average values in estimating the loads. For non-contact recreation target, significant reductions are required to meet the standard (Tables 3.26 A-D), especially under wet and intermediate conditions. If model uncertainty is considered, it is possible that, the bacteria level in the Buffalo Bayou is still above the standard even if a 100% reduction is achieved, e.g. that the standard may never be reached even with a removal of all the bacteria sources.	The average is typically used to describe the central tendency of a normally distributed data set. The median and geometric mean, on the other hand, are used to describe central tendancies of skewed distributions. Using the geometric mean, average or median does not involve uncertainty, but it does not represent the full range of the data set of the measured values. The calculated loads, however, in BLEST are compared against the full range of observed concentrations and loads in the bayous and not against the average, median or geometric mean. Box plots of the comparisons are shown in Appendix G. The bacteria data are variable, and so is the flow, but they are not "uncertain."
HC	39	On page 4, it states that typical travel times in the bayou are on the order of 5 to 7 days, but it may take considerably longer for all traces of runoff pollutants to exit the bayous. Please provide the basis for both portions of this statement.	Using average velocities measured during USGS sampling, travel times were computed. See USGS velocities presented in Appendix E for source of averages.
HC	41	The map on Page 8 of the Report shows that Subbasins 5, 6, 48, 49 are associated with Segment 1017 and Subbasin 38 is associated with Segment 1014. However, in the BLEST spreadsheet, all the above subbasins are associated with Segment 1013.	Noted. See new figure in Appendix G.
HC	42	On page 7 and 21, the Report states the waste load allocation to a TMDL includes all bacteria sources regulated through environmental permitting. However, the BLEST Model appears to ignore many WLA sources. Additional permitted contributions in the watershed include industrial facilities covered be individual and general wastewater and/or storm water permits, construction storm water permittees, and Phase II MS4 permittees.	The MS4 designation in BLEST was retitled to be regulated stormwater discharges. The entire watershed area was used to estimate the runoff load under the wet weather instream flow condition. Detailed delineation of regulated stormwater discharges into these subcategories may be part of implementation.

COMMENTS RELATED TO GENERAL TOPICS

Organization	Comments		Response
HC	43	There is no sensitivity and uncertainty analysis in data, parameters and models performed for the BLEST Model. The Model used many assumptions, geometric mean/average of data, and data/parameters obtained from other studies for other systems in literature. But there is no analysis for the sensitivity and uncertainty associated with these data and parameters. Sensitivity and uncertainty analyses on the loading calculations for various sources are necessary.	Uncertainty and sensitivity analyses were completed for the February 2007 stakeholder meeting. See the handouts provided at the meeting in Appendix H. In addition, two approaches for BLEST are presented in Appendix G.
HC	44	The results of a model are heavily dependent on the precision of the model as determined by calibration activities. There is no calibration conducted for the BLEST Model and we do not know if the BLEST Model calculated flows and loads are close enough to the observation.	See response to Harris County Comment 35.
HC		The Waste Load Allocations, and Load Allocations process is a source of concern to the JTF. This section has a number of questions, many of which could have probably been answered if full details of the formulae in the BLEST spreadsheet were available. One area of specific concern is that the BLEST spreadsheet is basically a mass balance, but it appears that it may not properly account for bacterial exiting in one reach and entering another reach in the process. Again, having the details and workings of the BLEST tool may have answered this question.	All formulas in the BLEST model were provided in a explanation sheet including an example calculation for a subwatershed. BLEST tool has been revised to facilitate its use by stakeholders as requested.
HC	113	How will the TMDL deal with the difference between the actual contributions from upstream sources, and the allocated load which is based on the flow multiplied by the contact recreation standard minus the margin of safety (page 73)?	Reductions will be required for the upstream sources in the same manner as for the downstream sources.
HC	114	Please provide some explanation of the method in calculating waste load and load allocations (Page 73 and 74). In this calculation, the load allocation is determined as the difference between the contact recreation target load and the upstream input and margin of safety. A reach not only receives bacteria from upstream, but also outputs bacteria to downstream. Some bacteria settle to the bottom of the reach, stay there and may resuspend. Others do not accumulate within the reach but go to the downstream reach with flow. However, the output is not reflected in the calculation. Is an initial bacterial concentration needed in the calculation of load allocation? If yes, what is the initial bacterial concentration used in the calculation? Being able to view the formulas in the BLEST spreadsheet would probably provide explanation.	An example will be used to respond to this comment. Segment 1014 is downstream from the reservoirs. The flow in this segment is derived from water sources from within the segment as well as flows coming in from the reservoirs. The loads in this segment are the sum of loads coming in from the reservoirs as well as loads coming in from sources located within the segment. To calculate the loads for segment 1014, both sources of loading are considered. However, to calculate the reductions needed for the segment it is assumed that the reservoirs would contribute no more than the standard allowable load. Thus, the reductions for the segment are based only on loads coming into the segment from sources within the segment (accounting of course for the margin of safety in this calculation). See response to Harris County Comment 44 regarding the BLEST tool and its formulae.

COMMENTS RELATED TO GENERAL TOPICS

Organization	Comments		Response
HC	115	The definitions of load allocation and waste load allocation on Page 73-74 are not clear. Please provide these in equation format so they can be compared. Also, the regrowth and die-off of bacteria don't seem to have been considered in the equation. On Page 73, it is stated that "if the dry weather condition load allocation was basically equivalent to zero, then the difference between the contact recreation target and estimated load was used as intermediate and wet condition load allocation instead". Why?	The definitions are expanded. As detailed in response to Harris County Comment 44, BLEST has been revised to facilitate its use by stakeholders. The statement on page 73 was removed to avoid confusion. Segment 1013 has very little flow coming in under dry weather conditions and that is the explanation for that statement.
HC	116	How was the target load (billion MPN/day) determined from the standard of contact recreation target (126 MPN/dL) in Table 3.26? Being able to view the formulas in the BLEST spreadsheet would probably provide explanation	The target load is the contact recreation standard times the flow. An explanation is now provided in the document. See response to Comment 44 from Harris County regarding BLEST.
HC	117	Why was 5% of the target load used for the margin of safety? Is this value of 5% based on any uncertainty analysis.	See TCEQ response #15 for a discussion of this issue.
HC	118	Why was the HSPF modeling approach abandoned and the BLEST spreadsheet substituted in the final TMDL allocation calculation? Were the HSPF models used for any allocation analysis? If yes, were the results of allocation analysis from the models comparable to those from the spreadsheet?	See City of Houston Comment 4.
HC	119	How were the previous efforts (e.g. HSPF modeling, bacteria source tracking, and investigation of bacteria in sediment) used in the allocation calculation, if any?	See City of Houston Comment 4.
Jensen	8	The simple and somewhat painful fact is that even after more than five years of study with the investment of almost one million dollars of public funds, we still do not understand completely the mechanisms that maintain high bacteria levels in the bayous at low flow. While we have theories and can eliminate certain sources, we cannot claim that we understand the reasons for the high levels or that certain actions will be effective in reducing bacteria levels to what will be suitable for contact recreation. If this document cannot be a basis for informed action to achieve the contact recreation criterion, there is a real chance that the investment of time and money in this TMDL study will be of no use at all. Furthermore, meeting this criterion is of questionable value as it is not clear who will be induced to swim in the treated wastewater if the criterion was to be attained.	See TCEQ responses #2a, #6, #8, and #18 for a discussion of these issues.

COMMENTS RELATED TO GENERAL TOPICS

Organization	Comments		Response
Pechacek		A review of the recently completed Bacteria TMDL Task Force Report dated 1/25/07 (TWRI Report) further reinforces concerns that the state approved process to calculate TMDL loads has been oversimplified. The TWRI Report recommends a three-tier approach to implementing bacteria TMDLs and developing IPs. The emphasis of this tiered approach appears to be related to cost-effectiveness for the regulating resource agency. The implementation approach discussed in the TWRI report is to begin with BMPs that are the most socially and economically acceptable. If standards are not met by target dates, then increasingly stringent measures should be implemented, presumably though enforcement.	Statements related to issues beyond the scope of the November 2006 project progress report.
Pechacek		In contrast, the regulated (permitted) communities stand to expend possibly billions in order to comply with these load allocations and load reductions. A sound scientific basis for calculating the loads and respective load reductions appears to have been preempted at the expense of developing simpler models that are more economical for the resource agency to implement. Given that over $1.3 million dollars has been expended on this BB/WOB TMDL study, taxpayers should expect the load calculation process to be technically sound, not be based on agency decisions that, on the surface, appear to cut corners.	See TCEQ response #3 for a discussion of this issue.
Pechacek		Although source and treatment control BMP's have had modest success in improving receiving water quality, it is quite doubtful that implementing a comprehensive BMP program in the two watersheds will be successful in meeting current bacteria state stream standards during all flow regimes. The primary unit processes of wastewater treatment include sedimentation, filtration and regimes. The primary unit processes of wastewater treatment include sedimentation, filtration and disinfection. BMP storm water treatment systems differ in that they do not have a disinfection component and typically operate over much higher and more variable flow and volume conditions. Although a comprehensive source and treatment BMP program may be able to achieve water quality standards for some cases, the complex and highly variable scenario constituting urban wet weather flows remains a significant problem that will likely require more than BMPs to solve.	See TCEQ response #16 for a discussion of this issue.
TXDOT	1d	**Clarify Work Status**: The work order descriptions in the introduction should be clarified with the inclusion of a table or bulleted list that outlines the sequence of work and conveys what work has been completed and is work is still in progress.	See response to City of Houston Comment 2.

COMMENTS RELATED TO GENERAL TOPICS

Organization	Comments		Response
TXDOT	1e	**Scientific Uncertainty Still Evident**: The scientific community still has little understanding of the mechanisms that maintain high bacteria levels at low flow. While we have theories and can eliminate certain sources, we cannot claim that we understand the reasons for the high levels or that certain actions will be effective in reducing bacteria levels to the current contact recreation criterion. In short, this document cannot be a basis for informed action to achieve the contact recreation criterion. Furthermore, meeting this criterion is of very questionable value as it is not clear who will be included to swim in the treated wastewater if the criterion was to be attained.	See response to Jensen Comment 8.
TXDOT	2b	**BLEST Inherently Does Not Consider Dynamic Processes**: The BLEST model adequately handles the accounting of conservative pollutants. The model can help account for loads in and out of the system. The model does not adequately handle consideration of dynamic processes and instream transport and fate processes such as settling, resuspension, regrowth, and die-off. We believe the model is not an appropriate tool to develop this TMDL.	The BLEST tool is a mass balance approach that is calibrated/validated to observed data. It calculates on a daily basis the loads coming from the various sources that are equivalent to the observed load to the stream. The tool accounts for instream processes of regrowth, settling, die-off, etc during the calibration/validation. (See Appendix G) . The spreadsheet approach was presented for the first time to the stakeholders in 2005 and no comments were made regarding the suitability or lack therefore for using the tool in developing the TMDL. See TCEQ response #10 for a discussion of this issue.
TXDOT	2d	**Describe Watershed Modifications**: The modification of Harris County Flood Control District subwatersheds mentioned in Section 3.1 should be adequately described as well as the reason for the modification. What water quality modeling needs were met by modifying the subwatersheds?	These subwatersheds are the same used in the HSPF model. Modifications are discussed in Section 5.1.2.1 the Work Order 2 report.
TXDOT	2y	35. **BLEST Total Loads Must Be Validated**: The calculated total loads in Table 3.26 need to be checked against actual instream monitoring results. The total bacteria loads should be divided by typical stream flows under each of the dry, intermediate, and wet conditions to determine the instream bacteria concentrations associated with these loads. The resulting concentrations should then be compared against the stream monitoring data at various locations to ensure that the load calculations are within the observed range. The table at present shows MS4 and OSSF being the dominate dry-weather loads. This result is biased because of the assumptions that inflated these two particular sources...	See response to Harris County Comment 35.

COMMENTS RELATED TO GENERAL TOPICS

Organization	Comments		Response
TXDOT	2z	36. **Existing Loads Are Incorrect:** This conclusion in Section 3.8 that the major loads are from wet weather MS4 discharges, bed resuspension and OSSF loads is in substantial error. It is based on completely unrealistic assumptions on MS4 and OSSF loads, and very unrealistic estimates of runoff loads from undeveloped areas versus developed (i.e. MS4) areas. The conclusion seems to completely ignore the effect of channelized streams carrying wastewater where re-growth and sediment re-supply can be a factor and where removal by settling is prevented.	This comment is identical to Jensen Comment 7 in the allocation section, see that comment for response.

COMMENTS RELATED TO THE MARGIN OF SAFETY

Organization	Comments		Response
COH	15	In Section 3.5, it is excessive to include both an implicit and explicit margin of safety (MOS), especially due to the explicit MOS including a future growth provision.	See TCEQ response #15 for a discussion of this issue.
HC	120	It is unnecessary and excessive to include implicit margin of safety, especially due to the explicit MOS including a future growth provision.	See TCEQ response #15 for a discussion of this issue.
TXDOT	2v	32. **Margin of Safety Inappropriately Selected:** In Section 3.5, it is unnecessary and excessive to include both an implicit and explicit margin of safety (MOS), especially due to the explicit MOS including a future growth provision.	See TCEQ response #15 for a discussion of this issue.

COMMENTS RELATED TO THE CONTRACT RECREATION STANDARD

Organization	Comments		Response
HC	1	The TMDL process is one in which a stream which is listed as "impaired" and not meeting the goal of "swimmable" and "fishable", is brought to a usable condition. The procedure for making this transition is the Total Maximum Daily Load (TMDL), which defines the amount of a target pollutant the stream can assimilate and still meet its defined standards. However, it is clear from this TMDL project that the fundamental underpinnings are inadequate and that the results are unsound. a. E. coli is an inadequate tool – The premise that a stream standard of 126 colonies E. coli/100mL is protective of human health, and that exceedances of this level are unsafe for primary recreational contact falls apart under scrutiny. Harris County has found that extremely high levels of E. coli exist wherever warm, moist, and nutrient-rich conditions allow, regardless of human impact or even animal presence. As an indicator of human health risk, E. coli falls far short of its goal of alerting resource managers of a human health risk.	See TCEQ responses #2a, #8, and #18 for a discussion of these issues.
HC	1	b. Use designations are not realistic – Streams in which full head immersions cannot occur because of low flow conditions are held to the same rigorous standards as a bathing beach. Citizens in Harris County do not use the subject streams for contact recreation, and, in many cases because of low flow, cannot use these streams for primary contact recreation. These are flood controls channels maintained during dry weather by wastewater treatment plant effluent and during wet-weather subject to life-threatening sudden and high flows. Harris County has requested a Use Attainability Analysis for these streams, but was denied by the Commission. Nonetheless, the question of holding these streams to an impossible use designation sets this TMDL up for failure.	See TCEQ responses #2a, #8, and #18 for a discussion of these issues.
HC	2	Harris County therefore strongly urges the TCEQ to refine its Surface Water Quality Standard for bacteria as well as its framework for use designations.	See TCEQ response #2 for a discussion of this issue.
HC	7	Please provide the reader with an explanation that the TMDL project uses indicator bacteria as a surrogate for estimating pathogens, and that these indicator bacteria are most often associated with fecal contamination but can also thrive in any moist nutrient-rich environment apart from animal inputs.	The TMDL is being developed for indicator bacteria. Indicator bacteria are used as an indicator of the presence of fecal matter from mammalian inputs. This has been emphasized in the report. See TCEQ response #2 for a discussion of this issue.
HC	8	Harris County requests the addition of a short discussion that the TMDL process is aimed at having contact recreation, in order to clarify this point to the reader.	The TMDL is aimed at meeting the standard, which for these water bodies is a contact recreation standard at this time. This discussion has been clarified in the report.

COMMENTS RELATED TO THE CONTRACT RECREATION STANDARD

Organization	Comments		Response
HC	9	Harris County requests the addition of a statement that the subject stream segments are WWTP-effluent-dominated systems, so that the reader understands that these are far from natural systems.	The report clearly explains that the zero to 30th percentile flow is mostly wastewater. Instream flows above the 30th percentile have contribution from runoff. The report also explains that on average there are 74 days of rain in Houston per year.
HC	10	Harris County requests an explanation to the reader that understanding bacteria loads is an exceedingly complex issue and that, despite extensive study and scrutiny, much of that uncertainty remains unresolved to date.	See TCEQ response #6 for a discussion of this issue.
Jensen	1	Section 1 - One thing that would be helpful would be to include a clear discussion in the introduction of the uses and criteria that are the objective of the work. It is important that the readers and decision makers working with this final report understand that the use that has been designated by TCEQ for Buffalo and Whiteoak bayous is contact recreation, and that use involves full head immersion swimming. The reader should also understand that the bulk of the water in the bayous is treated wastewater. Because of reluctance to swim in wastewater, however well treated, there is a real question of how much public benefit might be attained from meeting the criterion.	See TCEQ response #18 for a discussion of this issue.
Jensen	2	The target criterion for the study was developed from surveys of swimmers at swimming beaches with nearby wastewater sources, but these studies were done in the late 1970s and don't reflect current attitudes towards safety and security. The reader should also be informed that a criterion for "non-contact" recreation is also considered in the report. That criterion was selected by TCEQ staff in the last standards revision. It is a value selected with best professional judgment but has no technical or epidemiological basis.	See TCEQ response #18 and #21 for a discussion of this issue.
Jensen	9	From discussions with staff we understand that the recent modifications to the document have been made to produce a TMDL that might be approved by EPA and that would lead in the direction of actions that might be beneficial. These potentially beneficial actions include: more efforts to find and fix problem OSSFs, a more sustained effort at maintaining the sanitary sewer system, and efforts to support a more rapid process of diverting smaller recently annexed WWTPs into a regional system. We agree that it would be undesirable if the 5-yr TMDL effort were to have no effect at all, and are sympathetic to the effort to salvage a product.	Noted. The technical team for the project was not present during the referenced discussions with staff. The estimated loads and calculations that were undertaken in the November 2006 report were completed using the best available knowledge and were based on 5-years of study, numerous stakeholder meetings and comments and discussions from involved participants and stakeholders (see Appendix H). The goal of the study is to arrive at required reductions and allocations to meet the standard.

COMMENTS RELATED TO THE CONTRACT RECREATION STANDARD

Organization	Comments		Response
		We also agree that with the proper level of emphasis, the proposed actions are in general desirable. However, we have reservations for two reasons. One is that we are uncomfortable with the method—using values we don't believe are technically defensible in order to satisfy an administrative concept of approvability. The ends may not justify the means. The other is that this approach papers over the fundamental problem of having designated uses and criteria that are not appropriate. We maintain that full head-immersion swimming (the basis of the criteria) in the treated wastewater of Buffalo and White Oak Bayous is simply not a use that any significant portion of the public would support. Rather than trying to maintain an effort to achieve a use no one wants, it would be far better to use the significant capabilities of the stakeholder community of this TMDL to build consensus on a set of uses and criteria that can be supported for these waters.	See TCEQ responses #2a, #6, #8, and #18 for a discussion of these issues.
TXDOT	1a	**Add Discussion of Applicable Water Quality Standard**: The introduction would benefit from a clear discussion of the uses and criteria that are the objective of the work. It is important that the readers and decision makers working with this final report understand that the use that has been designated by TCEQ for Buffalo Bayou and White Oak bayous is contact recreation, which involves full head immersion swimming.	See TCEQ response #18 for a discussion of this issue.
TXDOT	1b	**Add Discussion that Flow is Treated Wastewater:** The readers should also understand that the bulk of the water in the bayous is treated wastewater and the physical conditions of the bayous are in general not suitable for full head immersion swimming.	See TCEQ response #19 for a discussion of this issue.
TXDOT	1c	**Add Discussion of Basis of Water Quality Criterion**: TCEQ target criterion was developed from surveys of swimmers at swimming beaches in fresh lakes in Oklahoma and New York with nearby wastewater sources, but these studies were done in the late 1970s and don't match Houston's climate, the riparian nature of White Oak and Buffalo Bayous, and the actual recreational uses. The readers should be informed that a criterion for "non-contact" recreation is also considered in the report. That criterion was selected by TCEQ staff in the last standards revision. It is a value selected with best professional judgment but has no technical or epidemiological basis.	See TCEQ response #18 for a discussion of this issue.

COMMENTS RELATED TO TMDL ALLOCATIONS

Organization	Comments		Response
COH	16	The waste load allocations in Table 3.26 indicate that all loads, including the dry weather MS4 loads, are to be reduced 100% or nearly 100%. Is this percent reduction attainable or achievable, even if unlimited financial and technical resources were devoted? Would allocation of resources of this significant level be socially acceptable? The report fails to discuss the implications of the proposed reductions.	See TCEQ responses #3 and #7 for a discussion of these issues.
Jensen	7	3.8 Summary. The conclusion that the loads are the result of wet weather MS4 discharges, bed resuspension and OSSF loads is in substantial error. It is based on unrealistic assumptions on OSSF loads, and very unrealistic estimates of runoff loads from undeveloped areas versus developed (i.e. MS4) areas. It does include a reasonable effort to address background inputs (from birds, etc.), but it seems to completely ignore the effect of channelized streams carrying wastewater where regrowth and sediment resupply can be factors and where removal by settling is prevented.	Noted. The OSSF loads were recalculated based upon new data provided by Harris County. Additionally, EMCs for some land use categories were changed based upon comments from Harris County. These recalculated loads reflect responses to stakeholder comments. Dr. Jensen did not provide new data to allow incorporation of the effects of "channelized streams carrying wastewater where regrowth and sediment resupply can be factors and where removal by settling is prevented" to recalculate load allocations. Thus, no changes were possible.

COMMENTS RELATED TO OTHER TOPICS

Organization	Comments		Response
HC	36	It has been shown that indicator bacteria regrowth is a significant factor in streams, especially in tropical/subtropical waters. (See Solo-Gabriele, Helena M., Melinda A. Wolfert, Timothy R. Desmarais, and Carol J. Palmer. *Sources of Escherichia coli in a Coastal Subtropical Environment*. Applied and Environmental Microbiology, January 2000, p. 230-237.; Desmarais, Timothy R., Helena M. Solo-Gabriele, and Carl J. Palmer.. *Influence of Soil on Fecal Indicator Organisms in a Tidally Influenced Subtropical Environment*. Applied and Environmental Microbiology, March 2002, p. 1165-1172.; and Carrillo, Martha, Eddie Estrada and Terry C. Hazen. *Survival and Enumeration of the Fecal Indicators Bifidobacterium adolescents and Escherichia coli in a Tropical Rain Forest Watershed*. Applied and Environmental Microbiology, August 1985, p. 468-476). It is noted that there was initially no regrowth accounting in the BLEST, then a small amount of regrowth was added with the caveat that die off cancelled out the regrowth amounts. While we would concur that die-off could be a sizable issue for a system that received an inoculum of bacteria and then no further bacteria were added, that is not the case with these waters. The base flow of both Buffalo and White Oak Bayous is overwhelmingly wastewater treatment plant effluent, which contain unnaturally high levels of nutrients required for bacterial growth.	Regrowth was evaluated and presented at the February 2007 stakeholder meeting using data from studies conducted by Harris County. Rates used for the stakeholder meeting were 2 per hour. The Harris County studies did not take into account settling and die-off. In response to this comment, the prior studies conducted by the project team indicate that the average decay rate representative of instream processes (regrowth, die-off, settling) was 2 per day, indicating overall declines rather than increases in loading. This net regrowth/settling/die-off rate has now been implemented into BLEST. See TCEQ responses #11 and #12 for a discussion of this issue. While it is not clear what flow is considered base flow and referred to in this case, it is noted that Houston bayous experience on average a rainfall event every 5th day and the instream flow between the 0 and 30th percentile is mostly effluent. Beyond that, the bayous receive contributions from runoff. Thus, while wastewater may be high in nutrients, there is a fair amount of dilution that occurs due to the mixing with runoff. What "nutrients" are necessary for the survival and replication of bacteria and the effects of these nutrients on bacteria populations in the environment are unknown factors, See TCEQ response #6 for a discussion of uncertainties in the study. The survivabillity of the E. coli in wastewater effluent was studied by the project team in the bayou via studies in Work Order 2. The studies indicated net die-off and no regrowth instream (chamber studies undertaken by PBS&J in Work Order 2).
HC	40	On page 5, median flow in bayou is reported as 10-20 MGD higher than the dry condition. Does this value apply to both bayous? How are the US Army Corps of Engineers reservoir releases to Buffalo Bayou included in the data?	This is a general statement to explain the difference between the flow conditions. The median flow changes from segment to segment and can be found for each segment in the BLEST tables. The discussion in the report has been expanded to avoid confusion.