Responsiveness Summary for
Long Branch (WBID 1627)
Dissolved Oxygen
November 2012

Commenter 1: Pinellas County (Kelly Hammer Levy)/Atkins North America

Comment 1-1:
General Comments applicable to all Dissolved Oxygen/Nutrient TMDLs:

Reducing nutrient loading to natural scenario conditions is an unachievable target given the extensive development in these WBIDs. Furthermore, the Florida Department of Environmental Protection (FDEP) has determined that these WBIDs are not impaired for nutrients following the guidelines set forth in the Impaired Waters Rule under Chapter 62-303 of the Florida Administrative Code. Nutrients in these WBIDs currently meet water quality standards and there is no evidence that nutrient or BOD reductions will improve dissolved oxygen concentrations. In fact, modeling in support of the TMDLs has determined that low dissolved oxygen is a natural condition and that nutrient reductions may even decrease dissolved oxygen levels in some cases.

Response 1-1: *Although some of the waterbodies referred to by the commenter are not currently listed as impaired for nutrients by FDEP, it is not necessarily correct to interpret this as meaning that those WBIDs meet all of the water quality standards for nutrients or that TMDL allocations for nutrients are unwarranted. All of the WBIDs are listed as impaired due to low dissolved oxygen (DO). Part of the state's narrative water quality criteria for nutrients, which applies to all classes of water, states that:*

> "The discharge of nutrients shall continue to be limited as needed to prevent violations of other standards contained in this chapter. Man-induced nutrient enrichment (total nitrogen or total phosphorus) shall be considered degradation in relation to the provisions of Sections 62-302.300, 62-302.700, and 62-4.242, FAC." [see Section 62.302.530 (48)(a) FAC]

In other words, anthropogenic enrichment of nutrients that causes or contributes to violations of other standards, such as dissolved oxygen, is not allowed. Because these waters were listed as impaired on the 1998 303(d) list, and EPA is under consent decree to make TMDL determinations regarding those waters, EPA has two possible choices to meet the consent decree requirements: 1) EPA could develop TMDLs to address the listed impairments or 2) EPA may make a determination that a TMDL is not needed. In order to determine that a TMDL is not needed for a particular waterbody, EPA would need sufficient evidence to show that the waterbody is either supporting its designated uses and meeting all applicable criteria related to the impairment, or show that the reason a waterbody is not meeting some or all of the criteria that apply to it is due to a natural condition of the waterbody. Given the high level of development in many of these watersheds, and the presence of anthropogenic sources of pollution that can cause or contribute to low DO, it is difficult to demonstrate that the instances

when these waterbodies fall below the DO standard are entirely natural, and not caused or exacerbated by anthropogenic pollution.

Long Branch Creek, WBID 1627, is one such waterbody that has been verified by FDEP as impaired for DO, but not verified as impaired for nutrients. FDEP has identified organic enrichment, including the influences of organic nitrogen and biochemical oxygen demand, as the probable causes of the DO impairment in Long Branch Creek (EPA, 2004). Indeed, the commenter's own consultant found evidence of a relationship between phosphorus and DO and between phosphorus and chlorophyll levels in WBID 1627 (Atkins, 2012). EPA does not have the ability to develop a new DO standard within the context of TMDL, so until the DO criterion is met or a site-specific alternative criterion for DO is established for Long Branch Creek, the TMDL must be developed to meet currently adopted water quality standards. Since the TMDL analysis could not identify a pollutant loading scenario under which Long Branch Creek can meet the applicable DO standard, the TMDL targeted the natural conditions provisions in Florida's standards [FAC 62-302.300(15)].

Thus the analysis attempted to determine the natural levels of nutrients and oxygen-demanding substances in the waterbody, and EPA considers that there is no assimilative capacity for additional pollutants.

References
Atkins, 2012. Review of EPA Proposed TMDLs in Pinellas County. August 2012.

EPA, 2004. Proposed Dissolved Oxygen TMDL for Long Branch Creek, WBID 1627, United States Environmental Protection Agency, Atlanta, GA, September 29, 2004.

Comment 1-2:
We support the FDEP's current efforts to revise the statewide dissolved oxygen criteria. The FDEP has recognized it is common for DO to fall below the existing criteria in healthy systems due to natural phenomena. Recent studies have confirmed that the existing criteria is not suitable for a large portion of the State's waterbodies as demonstrated in the review of the currently EPA proposed TMDLS.

Response 1-2: *In the course of developing numerous TMDLs for nutrients and/or DO in the state of Florida, EPA has identified waterbodies (including Long Branch Creek) in which the analysis showed that water quality standards for DO would not be met under natural conditions. To that extent, EPA also supports FDEP's efforts to study the issue and revise the statewide DO criteria. FDEP has the ability to make appropriate changes to the water quality standards that apply to a given waterbody, to adopt these changes according to the State's rulemaking process, and to submit standards changes to EPA, along with supporting documentation, for review. EPA encourages additional study on Long Branch Creek to determine whether site-specific conditions warrant changes to the applicable DO standard, and to confirm that such changes would continue to be protective of the waterbody's designated uses. In fact, the TMDL for Long Branch Creek WBID 1627 recommends the development of a site-specific standard in Section 9 of the TMDL report. As mentioned above, EPA cannot develop a new DO standard within the context of the TMDL, so the TMDL must target the adopted standards relevant to impaired parameters until such time as a new water quality standard is in place. The TMDL must be*

established pursuant to the schedule of EPA's commitments in the 1998 Consent Decree in the Florida TMDL lawsuit (Florida Wildlife Federation, et al. v. Carol Browner, et al., Civil Action No. 4: 98CV356-WS, 1998). However, the TMDL may be revised if different water quality standards are adopted, or if additional data or information becomes available.

Comment 1-3:
Modeled current condition concentrations in each WBID, except 1662, were well below FDEP's numeric nutrient criteria threshold for TP and TN as outlined in Table 4.1 in the TMDL reports. Requiring reductions below these concentrations is unfounded and likely unachievable.

Response 1-3: *As the commenter noted, FDEP recently adopted numeric nutrient criteria for many Class III waters in the state, including streams, which numerically interpret part of the state narrative nutrient criteria. Those criteria have been submitted to EPA for review pursuant to section 303(c) of the CWA, but EPA has not yet completed its review. Therefore, for streams in Florida, the applicable nutrient water quality standard for CWA purposes remains the Class III narrative criteria. As stated above, if the water quality standards that apply to Long Branch Creek are changed, the TMDL may be re-evaluated.*

The statement that current nutrient concentrations (in WBID 1627) are well below FDEP's numeric nutrient criteria for TN and TP is not completely accurate. While most of annual geomeans for total nitrogen would be below the threshold for the Peninsula Nutrient Watershed Region (1.54 mg/l), several recent years- more than one in three calendar years- have total phosphorus geomeans above the corresponding threshold (0.12 mg/l).

Since the TMDL analysis could not identify a pollutant loading scenario under which Long Branch Creek could meet the applicable DO standard, EPA considers that there is no assimilative capacity for additional pollutants beyond those that naturally occur in the watershed. As such, the TMDL analysis focused on quantifying the naturally-occurring watershed loads of those pollutants known to have the most impact on DO and on identifying what water quality conditions would exist if there were minimal to no impact from anthropogenic sources.

Comment 1-4:
The Technical Support Documents for the LPSC, EFDC, and WASP models used for TMDL determination are not available to the public. Without being able to view model assumptions, calibrations, and other details contained in these reports, Pinellas County and other stakeholders are unable to fully review, understand, and comment on the development of these TMDLs. Pinellas County requests these documents be made available and the comment period for the proposed TMDLs be extended 30 days once they are available.

Response 1-4: *It is unclear whether the commenter is requesting model documentation for each of those models, or for additional details regarding the application of these models to each waterbody. If the commenter is requesting the latter for Long Branch WBID 1627, such information may be found in the accompanying modeling report that was posted just below the TMDL report on EPA's website at the time the TMDL itself was proposed (Appendix A).*

If the commenter is requesting model documentation, such as user manuals that would explain the theory, use and applicability of each model, this information may also be found online at EPA's Watershed and Water Quality Modeling Technical Support Center website. Model documentation for WASP may be found at: (http://www.epa.gov/athens/wwqtsc/html/wasp.html). Model documentation for LSPC may be found at: (http://www.epa.gov/athens/wwqtsc/html/lspc.html). Although EFDC was not used to develop the TMDL for Long Branch Creek, documentation and model executables for EFDC and other models may also be found at the same website.

Comment 1-5:
There are numerous instances in each of the proposed TMDLs where an incorrect WBID or waterbody name is referenced or where a WBID, table, or graph number has not been included. The presence of error messages in some cases suggest a TMDL document template was automatically populated with some information. These mistakes show a lack of careful review by EPA staff that may have carried over into data analysis or data entry into the TMDL documents. Please verify WBIDs, data, and required reductions were entered into the TMDL documents correctly.

Response 1-5: *EPA often uses links for references to embedded figures and tables so that their numbering may be automatically updated if figures or tables are inserted or moved within the document. Such links also allow for the tables of contents to be created more easily. In reviewing the TMDL and modeling reports for Long Branch Creek, one broken link was discovered in each report. Unfortunately, link errors that cannot be seen in the word process-able version of a document are sometimes introduced when the documents are converted to PDF format for web posting. This should not be interpreted as a lack of careful review in the data analysis or preparation of documents. EPA will make every effort to fix all such typos and broken links in the final versions of TMDL and modeling reports.*

Comment 1-6:
The required reductions outlined in the TMDLs imply that relationships exist between nutrients and BOD and low dissolved oxygen. The attached report contains results of statistical analyses to determine the correlation between potential causative parameters and dissolved oxygen in these WBIDs. None of the WBIDs had significant relationships supporting all of the assumptions required for the proposed reductions and the few significant relationships that were found typically have low r' values. The lacking relationships are summarized for each WBID below.

Response 1-6: *As discussed in Section 5 of the TMDL report, there are several factors that may affect the concentration of dissolved oxygen in a waterbody. Among these factors is anthropogenic over-enrichment of nutrients (i.e. nitrogen and phosphorus) and oxygen-demanding substances (quantified as biochemical oxygen demand). Nutrient levels affect DO concentrations directly and indirectly. The process of nitrification, in which bacteria convert ammonia-nitrogen to nitrate-nitrogen, directly consumes oxygen from the water. Indirect effects of excessive nutrient loading involve over-stimulation of aquatic plant growth, which leads to exacerbated diurnal swings in DO as the plants photosynthesize during daylight hours, and respire at night. Replenishment of oxygen levels may be inhibited if excessive growth of aquatic plants above the water surface blocks sunlight from reaching submerged vegetation, reducing*

their ability to photosynthesize. Decomposition of algal and other types of organic matter, such as dead plants and animals, also uses up DO from the water.

The lack of strong statistical correlations between paired measurements of total nitrogen (TN), or total phosphorus (TP) and DO or chlorophyll is not uncommon, particularly in Florida's streams and rivers. This is due to the complexity of nutrient cycling in natural waterbodies, which results in variable time lags between the introduction of nutrients and their uptake and use by algae or other aquatic plants. Nutrients may be stored in sediment and/or organic materials and eventually re-introduced to the water column. Less available forms of nutrients such as organics must be broken down before they can be recycled for uptake. Other considerations include the fact that measuring chlorophyll concentrations in a water sample only provides a "snapshot" of the concentrations at the time and place the sample was taken, and the measurement only captures phytoplankton, the free-floating algae, and will not capture other types such as attached algae (periphyton), algae growing on bottom sediments (benthic), and other aquatic plants (macrophytes).

It is also not uncommon to have difficulty showing a strong statistical correlation between paired measurements of DO and BOD concentrations, but this does not automatically mean that the decomposition of excessive organic materials has no influence on the oxygen regime of that waterbody. BOD values are generated by laboratory tests that measure the amount of oxygen consumed by bacteria as they decompose the organic matter in a water sample over a given period of time, at a specified temperature. The standard test period for BOD is 5 days at 20 degrees Celsius; this measurement is termed BOD5. While BOD5 measurements are usually able to capture the majority of oxygen demand from the first (carbonaceous) stage of decomposition, five days is typically not enough time to allow for complete biochemical oxidation of the organic matter in a water sample. The nitrogenous stage, whereby oxygen is consumed in the process of converting organic nitrogen, ammonia and nitrite to nitrate-nitrogen, typically begins after a BOD5 test has ended. Tests that last 20 days or longer are required to measure the full oxygen demand. For obvious reasons, these long-term BOD tests are not performed as frequently as 5-day tests, especially when several BOD measurements will be made as part of a general monitoring program. Another factor to consider when attempting to correlate paired measurements of DO and BOD is that the DO concentration measure at a particular location and time is the result of processes that have already occurred, whereas the BOD concentration at the same location and time reflects an oxygen demand that will be exerted on the waterbody.

In Long Branch Creek, the lack of a strong correlation between DO and BOD is not surprising. The BOD dataset of WBID 1627 for 11/01/2005-03/21/2011 (IWR44) consists of only 25 samples- compared to 193 observations for DO- and only measurements of 5-day BOD. During the TMDL analysis for Long Branch Creek, it was determined that the majority of nitrogen is organic in nature, supporting the notion that the measurements of BOD5 capture only part of the oxygen demand in this stream. As such, it is difficult to draw firm conclusions about the full influence of BOD on DO concentrations in Long Branch Creek from correlation analysis of the available data. This is one reason why EPA elected to simulate the DO dynamics of the waterbody over a longer period of time.

Comment 1-7:

Independent correlation analyses showed no relationship between chlorophyll-a and BOD, TN and DO, or BOD and DO.

Response 1-7: *This concern was addressed in Response #1-6. The correlation that was found between TP and DO (and TP and chlorophyll-a) in WBID 1627 may be related to the fact that the majority of total phosphorus in Long Branch Creek was comprised of orthophosphorus, which is the form of the nutrient that is most readily available for uptake and use by aquatic plants.*

Comment 1-8:
The modeling efforts for this TMDL predict no difference in chlorophyll-a concentrations under existing and natural conditions. Dissolved oxygen levels were predicted to increase under existing conditions when compared to natural conditions, in spite of substantial increases in TN, TP, and BOD loading. It was determined that following the removal of all anthropogenic sources and land uses, dissolved oxygen will still not meet water quality standards and according to the model, it is likely DO will even decrease. The model predicts that DO would fluctuate between 0.5 and 3.5 mg/L during the summer months under natural conditions.

Response 1-8: *Please see Responses #1-1 and #1-3 for an explanation of how and why the TMDL allocations were set to natural conditions for Long Branch Creek WBID 1627.*

Comment 1-9:
The correlation analyses and modeling suggest factors other than nutrients and BOD are influencing DO levels. As outlined in the attached report other factors could include the influence of groundwater, which in a recently competed nutrient source evaluation was found to be a major influence to Long Branch Creek (ERD, 2012). Groundwater influence on DO in this WBID should be more closely examined and considered in TMDL development.

Response 1-9: *EPA cannot comment on the specific conclusions of the "recently completed nutrient source evaluation," since we do not have- and cannot locate- a copy of this report. (Note that the Commenter's letter did not include the full reference for the study.)*

TMDLs describe the maximum amount of pollutants that a waterbody can assimilate and still meet water quality standards. TMDLs attempt to account for <u>both</u> natural and anthropogenic pollutant sources, and consider physical characteristics of the waterbody (such as its depth, width, typical flows, etc) and other factors (such as climate) that can affect the response of a particular waterbody to those pollutants. The Long Branch Creek TMDL report discusses many physical and biological factors- including groundwater contributions- that can influence DO concentrations. Groundwater tends to have low levels of oxygen dissolved in it because it is not in contact with the atmosphere. Therefore, groundwater may lower DO when it first enters the stream, but since it is also typically colder than surface water (and colder water can hold more oxygen than warmer water), groundwater can also improve the ability of the stream to hold oxygen as it mixes and comes into contact with the atmosphere. To the extent that nutrient loads introduced to the stream via groundwater are not natural, careful management of land

applications and underground injections should help prevent contamination of groundwater resources and lower excessive loading of pollutants to the stream.

Comment 1-10:
According to IWR requirements, WBID 1627 is not impaired for nutrients. Although it was included in the 1998 303{d) list, it was delisted in Cycle 1. In Cycle 2, the nutrient assessment met the delisting provisions of the IWR with historical chlorophyll-a values meeting the criteria every year of the assessment period from 2001-2006. The annual averages were 2.8, 3.7, 5.8, 7 .8, 4.9, and 3.9, respectively. The FDEP Cycle 2 assessment for this WBID found BOD (not nutrients) to be the causative pollutant for DO impairment based on a median BOD of 2.6 mg/L. However, the lack of correlation found in the attached report between BOD and dissolved oxygen suggests it is unlikely to be a causative pollutant.

Response 1-10: *These concerns were raised in previous comments. Please see Responses #1-1, #1-2, and #1-3 for an explanation of why EPA developed TMDLs with nutrient allocations despite the fact that the waterbodies were not identified as impaired for nutrients according to the IWR screening thresholds. Please see Responses #1-6 and #1-7 for a discussion of reliance on correlation analysis to establish causation between DO and BOD, or DO and nutrients.*

Comment 1-11:
Pinellas County staff has reviewed the TMDLs referenced above and contracted with Atkins North America to evaluate the assumptions and scientific approach used in their development. The resulting report is attached and submitted as comments on behalf of Pinellas County.

(From Atkins report): According to the 1998 303(d) list, Long Branch Creek is a Class Ill freshwater waterbody impaired for DO and nutrients based on DO levels below the minimum value of 5.0 mg/L and nutrient concentrations exceeding levels necessary to prevent violation of Florida's DO criterion . The appropriate screening standards for a freshwater system for TN, TP, BOD, DO, and chlorophyll-a are 1.6, 0.22, 2.0, 5.0, and 20 respectively. The summary statistics in Table 22 are consistent with EPA's TMDL, indicating average DO levels below the minimum value of 5.0 mg/L. BOD levels were above the screening level but were not correlated with DO, suggesting it is unlikely to be a causative pollutant for DO impairment.

Table 22. TN, TP, Chl-a, DO, and BOD summary statistics for WBID 1627 from August 6, 2003 through March 21, 2011.

Parameter	WBID 1627 – Long Branch Creek			
	Count	Average	Median	Geomean
Total Nitrogen (mg/L)	192	1.1057	0.91	0.9822
Total Phosphorus (mg/L)	197	0.1522	0.12	0.1207
Chl-a (µg/L)	194	8.5160	2.95	3.8886
DO (mg/L)	227	3.5152	3.17	2.7325
BOD (mg/L)	69	4.3536	4.0	3.6537
Data from FDEP (IWR Run 45 - Verified Period)				

Response 1-11: *As a point of clarification, the values cited in the above comment are screening thresholds derived from the 70th percentile of all STORET data for Florida streams measured between the years 1970 to 1987. While the values have some use in identifying when streams*

have nutrient, BOD and chlorophyll concentrations that are particularly elevated compared to other waters of the state, the values are not adopted water quality standards that define thresholds of attainment versus impairment. Please see Responses #1-6 and #1-7 for a discussion of correlation analysis.

Comment 1-12:
(Atkins report): Independent correlation analyses between DO and potential causative parameters were completed (Table 23). Of the parameters evaluated, temperature explained the greatest percentage of variability (25%) seen in the DO data (Table 23). Although, both TN and TP were below the screening levels, there was a significant inverse correlation between TP and DO (r2 = 0.2). However, the low r2 value suggests a low level of certainty associated with the predictive powers. Chlorophyll-a was positively correlated with TN and TP concentrations but was not correlated with BOD levels (p > 0.05)(Table 24). There was no relationship between BOD and DO (p > 0.05)(Table 24). The TN:TP ratio for Long Branch Creek indicates a nitrogen limited system (TN:TP=7.3), however; this determination is in contrast to the empirically-derived correlations between nutrients and DO which suggest the possibility of a phosphorus limited system. Although the relationships between TP and DO and TP and chlorophyll-a suggest a possible need for a reduced TP load, the lack of relationship between chlorophyll-a and BOD, TN and DO, and BOD and DO, brings into question the need for a reduced TN and BOD loads in this waterbody.

Table 23. DO correlation with potential causative parameters for WBID 1662.

Potential causative parameter	Response parameter	Model	p value	r^2	Relationship
Temperature	**Dissolved oxygen**	**Linear**	**0.0000**	**0.25**	**inverse**
Total phosphorus	**Dissolved oxygen**	**Power**	**0.0000**	**0.12**	**inverse**
Turbidity	Dissolved oxygen	NS	0.3651	0.005	NS
Total nitrogen	Dissolved oxygen	NS	0.5861	0.002	NS
Conductivity	Dissolved oxygen	NS	0.1766	0.01	NS
BOD	Dissolved oxygen	NS	0.1651	0.03	NS
Total Suspended Solids (TSS)	Dissolved oxygen	NS	0.5195	0.26	NS
Color	Dissolved oxygen	NS	0.2103	0.14	NS
Data from FDEP (IWR Run 45 - Verified Period)					
NS = not significant					

Table 24.Correlations with potential causative parameters for WBID 1627.

Potential causative parameter	Response parameter	Model	p value	r^2	Relationship
Total nitrogen	**Chlorophyll-a**	**Linear**	**0.0000**	**0.31**	**direct**
Total phosphorus	**Chlorophyll-a**	**Linear**	**0.0000**	**0.14**	**direct**
BOD	Chlorophyll-a*	Power	0.1593	0.03	NS
BOD	Dissolved Oxygen	Linear	0.1651	0.03	NS
Data from FDEP (IWR Run 45 - Verified Period)					
NS = not significant					

Response 1-12: *Water temperature typically has a strong influence on DO concentrations, since cooler water is physically capable of holding more oxygen than warm water. In fact, many waterbodies exhibit a seasonal pattern in daily average DO, with lower average values observed during warmer months of the year.*

Nutrient limitation in waterbodies is dynamic over both space and time, so calculation of TN:TP ratios from grab-sample data tends to oversimplify this complexity. Waterbodies may spend some fraction of the time in co-limitation, aquatic organisms may adapt to changing conditions, and other factors may influence which nutrient most affects productivity. EPA believes that in most cases, it is important to design a remediation strategy that controls both nitrogen and phosphorus in order to prevent either from causing or contributing to water quality impairment in the immediate waterbody, or downstream.

Please see Responses #1-6 and #1-7 regarding reliance on correlation analysis alone to establish causation between DO, chlorophyll and other parameters.

Commenter 2: Florida Department of Transportation/Applied Technology and Management, Inc. (Janet Hearn)

Comment 2-1:
The authors did present some key components for a model development and calibration, including a comparison of the flows and presentation of the coefficients utilized in the WASP model development. Additionally, the authors recognized the impact of temperature on the DO conditions in Long Branch through their application and documentation of the WASP Heat model. The authors included a model report that attempts to outline the modeling process, coefficients, and assumptions utilized, and this is appreciated. There are a few key pieces of information that are needed for the model review that are not provided in the model report or TMDL report. These are listed below in the Detailed Comments.

Response 2-1: *Thank you for taking the time to review and comment on the proposed TMDL for dissolved oxygen in Long Branch Creek WBID 1627. EPA explains and summarizes the key elements of the TMDL approach and any models used in the TMDL and modeling reports.*

Comment 2-2:
The U.S. Environmental Protection Agency (EPA) prediction of "natural" condition loadings and in-stream nutrient concentrations is a critical aspect to this TMDL. More detail assessment of the reasonableness of the "natural" conditions needs to be provided.

Response 2-2: *How and why a natural conditions approach was used to develop a DO TMDL for Long Branch Creek was explained in the TMDL report, and discussed further in Responses #1-1 and #1-3. Long Branch Creek WBID 1627 was verified by FDEP as impaired for DO; this DO impairment was suspected to be caused by organic enrichment, including the effects of both carbonaceous and nitrogenous oxygen demand. EPA's assessment of ambient data confirmed that the WBID does not meet the applicable DO standard. Since EPA cannot demonstrate that the reason for this is entirely natural, and since the analysis could not identify a pollutant loading scenario under which Long Branch Creek could meet the 5.0 mg/l DO standard, EPA considers that the waterbody does not have assimilative capacity for pollutant loads beyond those naturally occurring in the watershed. As such, the TMDL analysis focused on quantifying what watershed pollutant loads would exist with minimal to no impact from anthropogenic sources. To simulate the natural condition scenario, all anthropogenic land uses (urban/impervious, agriculture, transportation/utilities) were reverted to forest in the watershed*

model and the associated event mean concentration for nitrogen, phosphorus and BOD were used in the analysis.

Comment 2-3:
At present, Florida is in the process of revising its DO criteria. While it is recognized at this time that EPA cannot assess against these criteria and must utilize the existing criteria, some acknowledgement of the determinations that have been made and recorded by the Florida Department of Environmental Protection (FDEP) that the DO criteria are at issue and are being modified should be put into the TMDL report.

Recommendation: The TMDL document and, specifically, the modeling report needs to be updated to include some key pieces of information outlined below in order to provide a more complete review. Therefore, it is recommended that EPA provide updated and complete modeling reports for additional review prior to finalization of the TMDLs. Additionally, EPA needs to provide more assurance that the "natural" condition loads are reasonable and accurate.

Response 2-3: *As the commenter acknowledged, EPA cannot assess against, or develop TMDLs to meet criteria that are not yet adopted. However, in response to this comment, language has been added to the Water Quality Standards section of the TMDL report noting that FDEP is working on revising the statewide DO criteria. Regarding the natural condition analysis, please see Responses #1-1, #1-3, and #2-2.*

Comment 2-4:
SECTION 1: INTRODUCTION
Last sentence of third paragraph, the reference to the figure has a source issue.

Response 2-4: *This link error has been fixed.*

Comment 2-5:
SECTION 4: WATER QUALITY STANDARDS/TMDL TARGETS
EPA acknowledges the potential for new nutrient criteria to impact the TMDL. Florida is also in formal process for alteration of the DO criteria. As such, it makes sense for EPA to acknowledge the potential changes to the DO criteria in this section and its impact on the TMDL.

Response 2-5: *As stated in Response #2-3, language has been added to the TMDL report about possible future revisions to the DO criteria and noting that the waterbody may be re-assessed and the TMDL re-visited if the applicable water quality standard changes.*

Comment 2-6:
SECTION 5: WATER QUALITY ASSESSMENT
The biochemical oxygen demand (BOD) data has a lot of non-detects. This needs to be dealt with in the data analyses and statistics adjusted accordingly.

Response 2-6: *Summary statistics were provided to give the reader a sense of the number, range and tendency of the available BOD observations. Calculating the statistics with non-detect values equal to the detection limit provides a slightly conservative estimate of the mean.*

However, re-calculating these summary statistics using different assumptions for detection limit values would not affect the TMDL analysis that was done.

Comment 2-7:
SECTION 5: WATER QUALITY ASSESSMENT
Overall, the total nitrogen (TN) and total phosphorus (TP) data are not excessively elevated in relation to typical values in natural systems in the area. Also, the report acknowledges that the TN is primarily in organic form, and overall the inorganic levels are not high.

Response 2-7: *The commenter is correct that the data indicate the majority of nitrogen is organic in nature. As stated in Response #1-1, the oxygen demand from organic enrichment is thought to be contributing to suppression of DO levels in Long Branch Creek. Regarding the question of whether nutrient levels in Long Branch Creek are elevated relative to natural systems in the area, please see Response #1-11 for a discussion of Florida's screening thresholds, and Response #1-3 for a discussion of Florida's proposed Numeric Nutrient Criteria.*

Comment 2-8:
SECTION 5: WATER QUALITY ASSESSMENT
The Chlorophyll *a* (Chl *a*) values are low overall and would not indicate algal response issues. The report acknowledges that this does not account for other issues such as peryphyton, etc.

Response 2-8: *The water quality assessment in the TMDL report concludes: "Although there are several instances of elevated chlorophyll concentrations, the data do not suggest a chronic overgrowth of phytoplankton algae. However, it is important to interpret the data with the understanding that measuring chlorophyll concentrations in a water sample only captures phytoplankton, the free-floating algae, and will not capture other types such as attached algae (periphyton), algae growing on bottom sediments (benthic), and other aquatic plants (macrophytes)."*

Comment 2-9:
SECTION 7: ANALYTICAL APPROACH AND MODELING REPORT:
The flow calibration looks reasonable.

Response 2-9: *We agree that the calibrated LSPC model shows good agreement between predicted and observed flow volumes and between predicted and observed mean monthly flows over the simulation period.*

Comment 2-10:
SECTION 7: ANALYTICAL APPROACH AND MODELING REPORT:
The BOD is basically calibrated to eight values that appear to be non-detectable. The model also projects some high BOD levels, but it is hard to verify as these are CBODu and are compared to limited ND BOD5 values. Typically, some discussion of conversions of BOD5 to CBODu for comparison purposes is provided. The modeling report needs to provide this discussion.

Response 2-10: *Due to the relatively limited number of BOD data points, the water quality model was not explicitly calibrated to the ambient BOD data. The scale factor for conversion of BOD5 to CBODu was 1.5 (see Section 3.3.2 of the modeling report).*

Comment 2-11:
SECTION 7: ANALYTICAL APPROACH AND MODELING REPORT:
The report needs to present inputs to WASP model coming out of the LSPC model, so one can assess the reasonableness of the LSPC inputs to the model.

Response 2-11: *The administrative record for this TMDL contains all of the models and their associated input and output files. As with any TMDL, this information is available to the public and may be reviewed at any time.*

Comment 2-12:
SECTION 7: ANALYTICAL APPROACH AND MODELING REPORT:
The WASP calibration coefficients are presented along with the existing condition sediment oxygen demand (SOD) utilized.

Response 2-12: *Comment noted.*

Comment 2-13:
SECTION 7: ANALYTICAL APPROACH AND MODELING REPORT:
It appears that a constant reaeration rate was utilized rather than something that would respond to the flows and velocities in the creek. This should be explained and the value justified based upon the measured flows and some knowledge of cross-sectional area.

Response 2-13: *In water quality models, flow-induced reaeration is often calculated based on the Covar method. This method calculates reaeration as a function of velocity and depth by one of three formulas: Owens, Churchill, or O'Connor-Dobbins, respectively. The Owens formula is automatically selected for segments with depth less than 2 feet. For segments deeper than 2 feet; the O'Connor-Dobbins or Churchill formula is selected based on a consideration of depth and velocity. Deeper, slowly moving rivers require O'Connor-Dobbins; moderately shallow, faster moving streams require Churchill. Each formula estimates that reaeration rates are proportional to depth-average velocity and inversely proportional to total depth. The low DO in Long Branch Creek required a low reaeration rate constant of 0.4 per day to give a better fit with the observed DO data.*

Comment 2-14:
SECTION 7: ANALYTICAL APPROACH AND MODELING REPORT:
The model report should provide some documentation of the geometric information (i.e., channel width, depths) used for the reaches in WASP and provide information to show that the values used are reasonable compared to actual cross-sectional information, since this will be a key factor in accurately simulating the velocities.

Response 2-14: *The watershed and water quality model files are included in the Administrative Record for this TMDL and are available upon request. Details about the lengths, widths, depths, and cross-sectional areas used, etc are available in these files.*

Comment 2-15:
SECTION 7: ANALYTICAL APPROACH AND MODELING REPORT:
The report identifies that "The SOD rate was also lowered in the natural run, to reflect the reduced nutrient and BOD loadings." The report needs to provide the revised value (existing was 2.0 gm/m^2/day) and a justification for the level of reduction.

Response 2-15: *In response to this comment, the lower SOD rate (1.2 g/m^2/day) used for the natural run was added to Section 4.1 of the modeling report. The existing SOD was estimated to be around 2.0 g/m^2/day, and an SOD of 1.2 g/m^2/day was used in the TMDL scenario (a reduction in SOD of approximately 40%). Reductions in BOD and nutrients should significantly reduce SOD. BOD is a measure of the amount of oxygen consumed by organisms as they break down organic material in the water column, and SOD is created when organic matter and sediment introduced into the water column settle to the bottom. Both exert an oxygen demand on the water column.*

Comment 2-16:
SECTION 8 AND TMDL DETERMINATION:
The report identifies for the natural condition loading that 80 to 90 percent reductions in TN, TP, and BOD loading reflect the "natural" condition. As the determination of the "natural" condition is key to this assessment, some discussion and/or justification of the reasonableness of that determination should be provided.

Response 2-16: *Questions regarding the natural condition scenario were discussed in Responses #1-1, #1-3 and #2-2. The high reductions calculated from this approach, which simulates pollutant loadings from the watershed as if it remained in its undeveloped state, reflect the fact that the watershed is almost completely developed (94%), and that only about 6 percent remains in a natural land use such as water, wetlands, or forest.*

Comment 2-17:
SECTION 8 AND TMDL DETERMINATION:
Based on looking at the natural concentrations that show reductions on the order of around 25 to 40 percent for TN and TP, much of the load reduction must come from reductions in flow due to the "natural" condition having much less impervious area. It would be useful, therefore, to see the changes in flows that occur from the existing to the "natural" condition in the report.

Response 2-17: *The commenter is correct that the modeling predicted reductions in the average annual concentration TN and TP of around 22 and 43 percent, respectively, and that the primary reason the load reductions are higher is due to the much higher volume of runoff under the existing conditions scenario. Per the commenter's request, a figure comparing flows from under the existing condition and natural condition scenarios was added to the modeling report.*