UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

SEP 20 2011

Ms. Kathy Stecker
Supervisor, Modeling and TMDL Unit
Division of Water Quality
North Carolina Department of Environment
and Natural Resources
P. O. Box 29535
Raleigh, North Carolina 27699-1617

Dear Ms. Stecker:

The United States Environmental Protection Agency has completed a review of the Fecal Coliform Total Maximum Daily Load (TMDL) for Bear Creek (Waterbody IDs 19-41-11a1, 19-41-11a2, 19-41-11a3, 19-41-11b1 and 19-41-11b2) in Onslow County, North Carolina, that was submitted to the EPA on September 7, 2011. Based upon our review, we have determined that the statutory requirements of the Clean Water Act, Section 303(d) have been met and hereby approve this TMDL.

The enclosed Decision Document summarizes the elements of the review which were found to support the EPA's approval of the TMDL. If you have any questions or comments, please feel free to contact Mrs. Alya Singh-White of my staff at (404) 562-9339.

Sincerely,

James D. Giattina
Director
Water Protection Division

Enclosure

TMDL Review Checklist

Final TMDL

TMDL Document Name: Total Maximum Daily Loads of Fecal Coliform for Bear Creek	**County/State:** Onslow County, North Carolina
Reviewer: Alya Singh-White	**HUC:** 03020106020060
Date of Submittal: September 7, 2011	**Use Classification:** SA - Shellfish Harvesting, propagation of aquatic life, recreation and biological integrity
Pollutant(s): Fecal Coliform Bacteria (FC)	**ESA / EJ Issues?** No
Type of TMDL(Point / Nonpoint /Both): Both	

Waters Addressed By TMDL:

Waterbody Name – [AU]	Description	Water Quality Classification	Acres
Bear Creek – [19-41-11a1]	From source to DEH closed area line	SA;HQW	88.1
Bear Creek – [19-41-11a2]	DEH CAC area along north shore of creek	SA;HQW	8.2
Bear Creek – [19-41-11a3]	DEH CAO area along south shore of creek	SA;HQW	19.2
Bear Creek – [19-41-11b1]	DEH CAC area along north shore of creek	SA;HQW	12.1
Bear Creek – [19-41-11b2]	DEH CAO area along south shore of creek	SA;HQW	179.8

Additional National TMDL Tracking System Entry Parameters

TMDL doc ID: to be created	**EPA Developed?** No	**TMDL Target:** The water quality target was set at 38cfu/100ml, which is 10% lower than the water quality criteria of 43cfu/100ml.
303(d) List ID: (*See Above*)	**Lead State:** NC	
303(d) List Cycle (Yr): 2010	**Pollutant ID:** 259	

Impacted PCS NPDES Permit IDs:

North Carolina Department of Transportation is the only permitted facility in the Bear Creek Watershed.

Facility Name	Permit #	Type
NCDOT MS4	NCS000250	Stormwater

Impacted Non-PCS Permit IDs:
None

TMDL Review Checklist

Review Element	Required	Included (*check if yes*)
Submittal Letter	**Yes**	**X**
Scope of TMDL	**Yes**	**X**
Applicable Water Quality Standards and Numeric Targets*	**Yes**	**X**

Loading Capacity*	**Yes**	**X**
Wasteload Allocations (WLAs)*	**Yes**	**X**
Load Allocations (LAs)*	**Yes**	**X**
Margin of Safety (MOS)*	**Yes**	**X**
Seasonal Variation*	**Yes**	**X**
Public Participation	**Yes**	**X**
Other Considerations	**As necessary**	**X**
Recommended Action	**APPROVAL**	**X**

*These elements are required by statute and implementing regulations.

TMDL Review Checklist Supporting Rationale and Comments

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 CFR §130 describe the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under §303(d) and EPA regulations. When the information listed below uses the verb *"must"* or "require," this denotes information that is needed by EPA to review elements of the TMDL required by the CWA and by regulation.

Submittal Letter

Considerations:

- **Each final TMDL submitted to EPA should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under §303(d) of the Clean Water Act for EPA review and approval.** This clearly establishes the State/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute.

Conclusions:

This final TMDL document was received by EPA for review and approval by letter on September 7, 2011 and signed by Kathy Stecker, Modeling/TMDL Unit Supervisor.

Scope of TMDL

Considerations:

- **The TMDL should describe the waterbody as it is identified on the State/Tribe's §303(d) list, the pollutant(s) of concern, and the applicable water quality criteria that led to impairment listing.** The waters addressed by the TMDL must be identified and consistent with the 303(d) list.
- The TMDL should include a statistical evaluation of all readily available data that was used to place the waterbody on the 303(d) list.
- The TMDL submittal must include a description of the point, nonpoint, and natural background (where possible) sources of the pollutant of concern. **Such information is necessary for EPA's review of the load and wasteload allocations, which are required by regulation. The TMDL submittal should also contain a description of any important factors, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation, as applicable; and (3) present and future growth trends, if this is a factor that was taken into consideration in preparing the TMDL.**

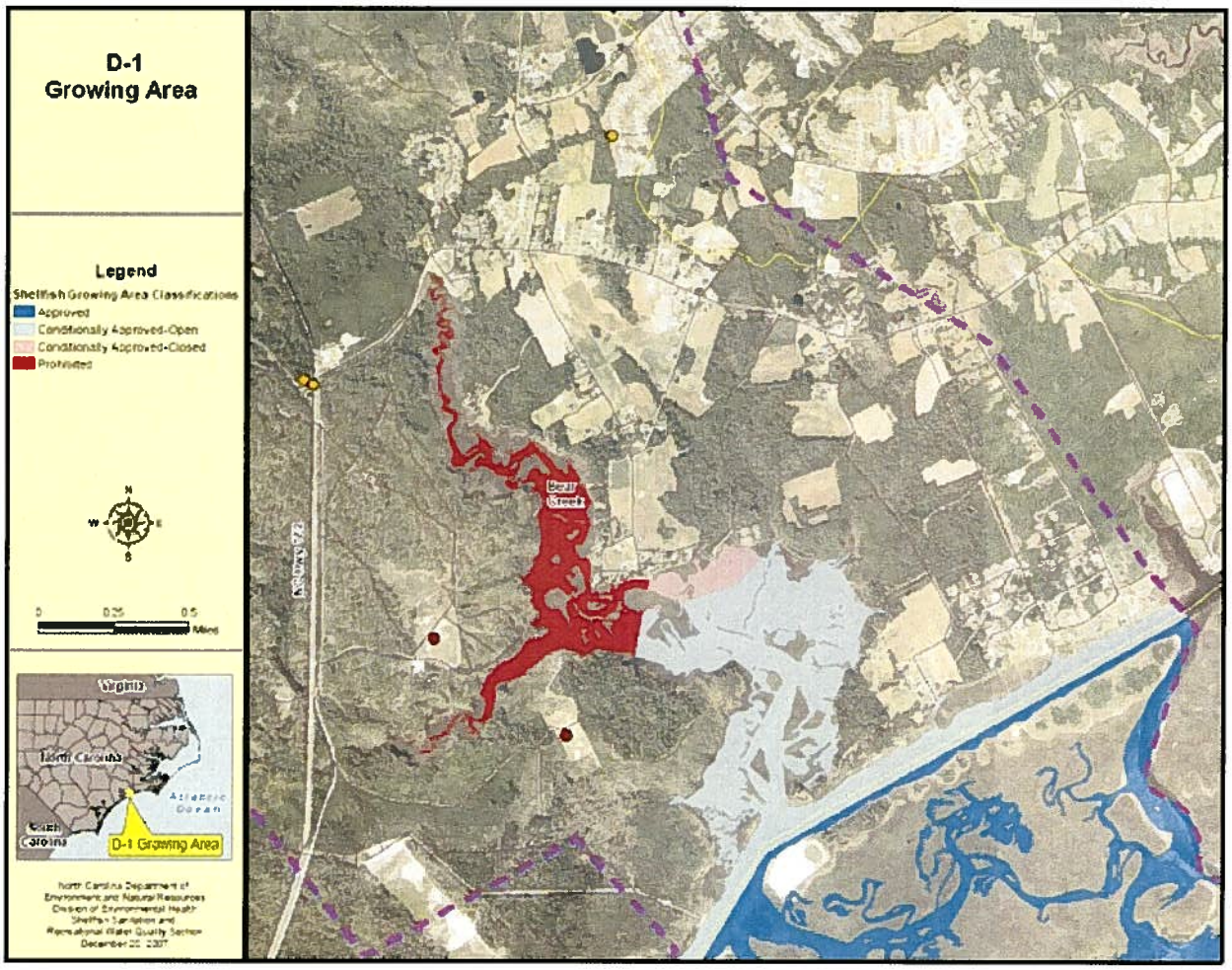
Conclusions:
Five Waterbody IDs (WBID) of Bear Creek and its tributaries are listed as impaired on the State's 2010 §303(d) list due to excessive FC numbers documented during the 2005-2010 sampling period. A detailed summary of the monitoring data can be found in Appendix A of the TMDL report.

Section 2.0 of the TMDL document pertains to source assessment. Sources include both point (NCDOT MS4) and nonpoint sources; nonpoint sources include waste from wildlife and pets, failing septic systems and agriculture (direct deposition and runoff).

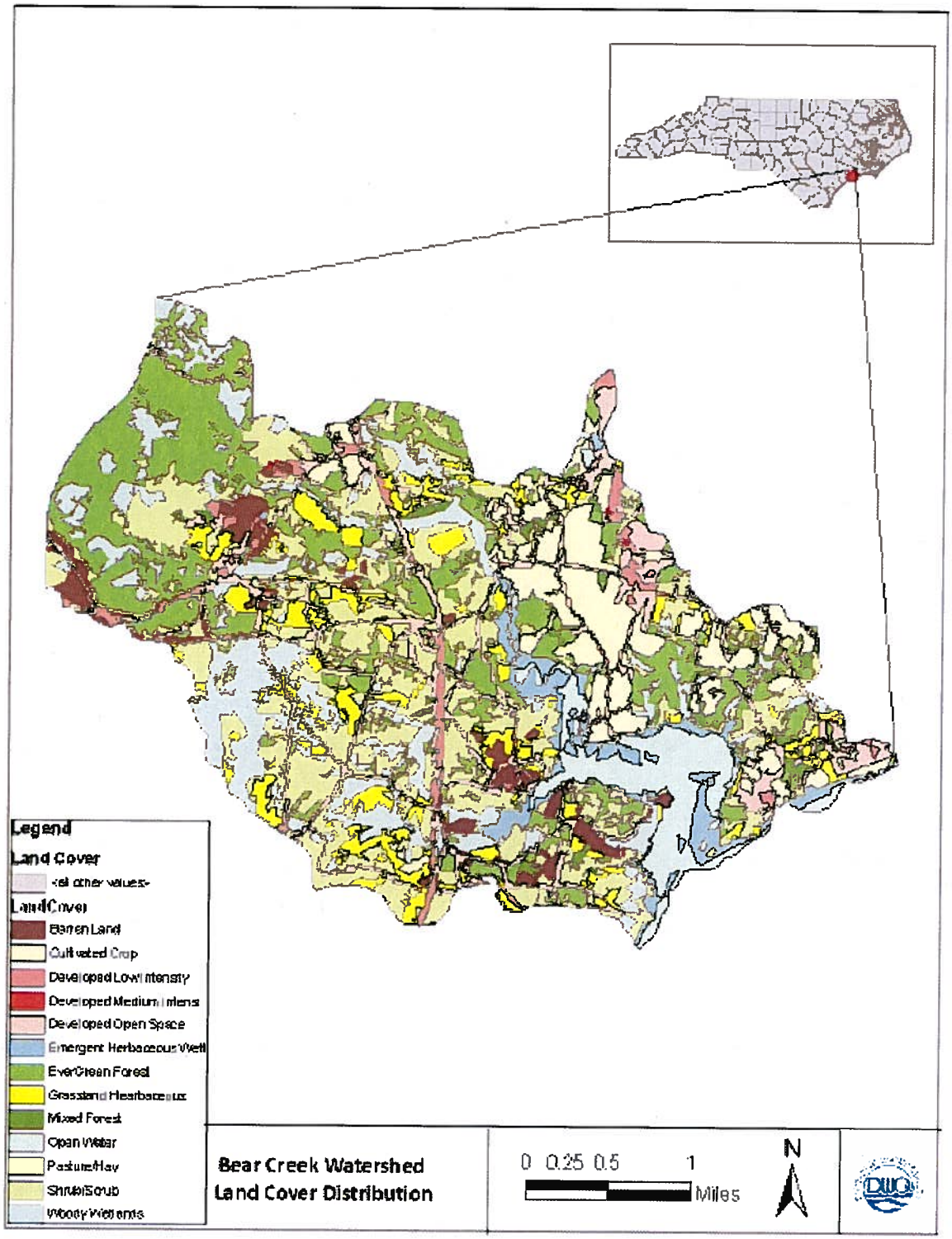
Section 1.3 of the TMDL document pertains to watershed description. The distribution of land use is shown in the table below; also see watershed and land use maps on the following pages.

Land Cover Category	Area (acres)	Percent Total
Developed Low Intensity	200.0	2.89%
Developed Medium Intensity	4.3	0.06%
Developed Open Space	593.5	8.56%
Cultivated Crop	612.7	8.84%
Pasture/Hay	2.4	0.03%
Evergreen Forest	1450.7	20.93%
Mixed Forest	169.0	2.44%
Herbaceous Grassland	511.1	7.37%
Shrub/Scrub	1672.6	24.13%
Emergent Herbaceous Wetland	253.6	3.66%
Woody Wetlands	879.6	12.69%
Barren Land	217.9	3.14%
Open Water	365.2	5.27%
Total Area	6932.8	100.00%

Map of Bear Creek Shellfish Harvesting Area



Land Use Map of Bear Creek Shellfish Harvesting Area



Loading Capacity

Considerations:

- EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards [40 CFR §130.2(f)]. The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure [40 CFR § 130.2(i)]. **The TMDL submittal must identify the waterbody's loading capacity for the applicable pollutant. To the degree it is known, it should also describe the cause and effect relationship between the identified pollutant sources, the numeric target (narrative target if appropriate), and achievement of water quality standards.**
- **Supporting documentation for the TMDL analysis must also be contained in the submittal. This should include a description of the analytical process used, results from water quality modeling, assumptions, etc.** The TMDL submittal should also contain a description of other important factors, such as an explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable.
- **Critical conditions must be considered as part of the analysis of loading capacity [40 CFR § 130.7(c)(1)].** Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that result in attaining and maintaining the water quality criterion and have an acceptably low frequency of occurrence. Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.

Conclusions:

The TMDL was calculated using the tidal prism model. The Tidal Prism Water Quality Model (TPWQM) simulates tidal transport in terms of the concept of tidal flushing. The tidal prism is the amount of water entering and leaving a coastal basin during each tidal cycle. The TPWQM can simulate pollutant transport in an estuary both temporally and spatially. The input data required to run the model includes tidal range, surface area, and depth of the waterbody. Thus, the tidal prism for the modeling area can be estimated based on the volume of the basins and the tidal range in the area. Due to the geometry of the embayment, the model was broken down into segments (model segmentation shown in Figure 3.1 of the TMDL document). Model approach, load calculations and TMDL allocations can be found in Section 3 of the TMDL document.

The 90th percentile concentration is the concentration exceeded only 10% of the time. Since the model simulation period spans 5 years, the critical condition is implicitly included in the value of the 90th percentile of model results. Given the length of the monitoring record and model simulation and the standard's recognition of unusual and infrequent events, the 90th percentile is used instead of the absolute maximum.

Wasteload Allocations (WLAs)

Considerations:

- **EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources [40 CFR §130.2(h)].**
- **Wasteload allocations must be assigned to each point source discharging the pollutant of concern [40 CFR 130.2(i)]. WLAs can be expressed as lumped or aggregate allocations if appropriate.**
- **If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero.**
- **The wasteload allocations should be sufficient, in consideration of nonpoint source loads, to ensure that the point sources will not cause or contribute to excursions of water quality standards [40 CFR §122.44(d)(1)].**

Conclusions:

North Carolina Department of Transportation is the only permitted facility in the Bear Creek Watershed; however the road right of way (ROW) is only 1% of the total watershed and therefore is not considered a major source of FC. The WLA for NCDOT by model segment is shown below and in Table 3.5 of the TMDL document.

NPDES Permittee	Segment #	NCDOT Existing Permitted Load (MPN/day)	WLA (MPN/day)	Percent Reduction
NCDOT	m1	N/A	7.60E+09	0%
	m2	N/A	1.74E+09	0%
	m3	N/A	1.04E+09	0%

Load Allocations (LAs)

Considerations:

- **EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background [40 CFR §130.2(g)].** Load allocations may range from reasonably accurate estimates to gross allotments [40 CFR §130.2(g)]. Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.

- **If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero.**

Conclusions:

The load allocation for model segments in Bear Creek Watershed is in Table 3.6 of the TMDL document and in the table below.

Segment #	LA (MPN/day)
m1	6.07E+11
m2	1.39E+11
m3	1.02E+11

Margin of Safety (MOS)

Considerations:

- **The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality [CWA §303(d)(1)(C), 40 CFR § 130.7(c)(1)].** EPA guidance explains that the MOS may be implicit, i.e. incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e. expressed in the TMDL as loadings set aside for the MOS.

- **If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.**

Conclusions:

Section 3.3.1 of the TMDL states that an explicit MOS was included in the TMDL calculation as a conservative estimate. The explicit MOS was achieved by applying a 10% load reduction from the calculated TMDL. See table below.

		Fecal Coliform Load (MPN/day)					
Waterbody	AUs	Existing Load[1]	WLA[2]	LA	MOS	TMDL	% Reduction
Lower Bear Creek (m1)	19-41-11b2	-	7.60E+09	6.07E+11	6.83E+10	6.83E+11	0%
Middle Bear Creek (m2)	19-41-11a2, 19-41-11a3, 19-41-11b1, 19-41-11b2	-	1.74E+09	1.39E+11	1.57E+10	1.57E+11	0%
Upper Bear Creek (m3)	19-41-11a1	3.67E+11	1.04E+09	1.02E+11	1.15E+10	1.15E+11	69%

Seasonal Variation

Considerations:

- **The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for considering seasonal variations in the TMDL must be described [CWA §303(d)(1)(C), 40 CFR §130.7(c)(1)].**

Conclusions:

The variability in this TMDL is accounted for by using water quality monitoring data from 2005 through 2010, which includes data collected under various seasonal conditions.

Public Participation

Considerations:

- **EPA regulations require public review [40 CFR §130.7(c)(1)(ii), 40 CFR §25] consistent with State or Tribe's own continuing planning process and public participation requirements.** In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State/Tribe's public participation process, including a summary of significant comments and the State/Tribe's responses to those comments.

Conclusions:

The TMDL was made available to the public for review and comment starting August 1, 2011 and ending September 1, 2011. Copies of comments received and response to those comments are included in the TMDL submittal package (Appendix D). All comments were appropriately addressed by NCDENR.

Other Considerations

Considerations:

- This section may be needed in the TMDL review in order to describe unique factors or information specific to the TMDL under review, which help explain the basis for EPA's decision.

Conclusions:

None.

Final Recommendation/Comments

The Pollution Control and Implementation Branch recommends that the TMDL be **APPROVED**.