



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION I  
5 POST OFFICE SQUARE SUITE 100  
BOSTON, MASSACHUSETTS 02109-3912**

September 28, 2017

Emily Boedecker, Commissioner  
Vermont Department of Environmental Conservation  
1 National Life Drive, Main 2  
Montpelier VT 05620-3522

**SUBJECT: Approval of Lake Memphremagog TMDL**

Dear Commissioner Boedecker:

Thank you for your submittal of the Total Maximum Daily Load (TMDL) document for Lake Memphremagog. This lake is included on Vermont's 2016 303(d) list and was prioritized for TMDL development. The purpose of the TMDL is to address aesthetics and contact recreation impairments caused by phosphorus and resulting algae blooms.

The U.S. Environmental Protection Agency (EPA) hereby approves Vermont's August, 2017 TMDL for Lake Memphremagog, submitted with a cover letter dated August 8, 2017. EPA has determined that this TMDL meets the requirements of §303(d) of the Clean Water Act (CWA), and of EPA's implementing regulations (40 CFR Part 130). A copy of our approval documentation is enclosed.

Thank you again for your submittal. We were pleased with the quality of this TMDL. My staff and I look forward to continued cooperation with VTDEC in exercising our shared responsibility of implementing the requirements under Section 303(d) of the CWA.

Sincerely,

/s/

Art Johnson, Acting Director  
Office of Ecosystem Protection

Enclosure

cc: Tim Clear, VTDEC

## EPA NEW ENGLAND'S TMDL REVIEW

**TMDL:** Lake Memphremagog, Orleans County, Vermont  
Waterbody VT17-01L01

**STATUS:** Final

**DATE:** September 28, 2017

**IMPAIRMENT/POLLUTANT:** Aesthetics and contact recreation due to excessive phosphorus loading. The TMDL is calculated for total phosphorus (TP).

**BACKGROUND:** The Vermont Agency of Natural Resources (VANR) submitted to EPA New England the final Lake Memphremagog TMDL for total phosphorus (TP) with a transmittal letter dated August 8, 2017.

**REVIEWERS:** Eric Perkins (617-918-1602) E-mail: perkins.eric@epa.gov

### REVIEW ELEMENTS OF TMDLs

*Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. § 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 Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation.*

#### **1. Description of Waterbody, Pollutant of Concern, Pollutant Sources and Priority Ranking**

*The TMDL analytical document must identify the waterbody as it appears on the State/Tribe's 303(d) list, the pollutant of concern and the priority ranking of the waterbody. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). 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 assumptions made in developing the TMDL, 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 to sources; (3) present and future growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments, or chlorophyll *a* and phosphorus loadings for excess algae.*

The TMDL describes the waterbody and the cause of impairment as identified in the 303(d) list. The lake is impaired by total phosphorus and ranked high for TMDL development. Lake Memphremagog is a large lake located in Orleans County, VT, as well as the Province of Quebec. While most of the lake surface lies in Quebec (73%), most of the lake watershed lies in VT (71%). Only the VT portion of the lake is considered impaired as the Quebec portion is

meeting applicable phosphorus guidelines for the Province. Nonetheless, the modeling and restoration efforts have been supported by both entities through a collaborative process guided by the Quebec Vermont Steering Committee on Lake Memphremagog. Land use within the Vermont portion of the watershed is 70% forest/shrub, 17% agricultural, 8% water/wetland, and 5% developed.

Lake Memphremagog has a history of occasional late summer algal blooms and has been listed on Vermont's impaired waters list since the 1990s. Phosphorus concentrations have been well above the phosphorus criterion of 14 ppb for most of the past 25 years. The TMDL indicates that pollutant loading comes from a variety of sources, including agricultural activities, developed lands, forested lands, stream channel erosion, and a small percentage (1%) from wastewater treatment plants. The TMDL document presents the magnitudes of all the loading categories in Section 4.

**Assessment:** EPA Region 1 concludes that Vermont DEC has done an adequate job of describing the waterbody, pollutant of concern, and pollutant sources.

## **2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target**

*The TMDL submittal must include a description of the applicable State/Tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) must be identified. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.*

The TMDL report describes the applicable water quality standards including designated uses and applicable numeric criteria (Section 3 of the TMDL report).

Vermont's water quality standards specify a numeric phosphorus criterion for Lake Memphremagog of 14 ppb.

**Assessment:** EPA Region 1 concludes that VTDEC has properly presented its water quality standards and the applicable numeric water quality target.

## **3. Loading Capacity - Linking Water Quality and Pollutant Sources**

*As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards (40 C.F.R. § 130.2(f)). The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. § 130.2(i)). The TMDL submittal must identify the waterbody's loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process,*

*results from water quality modeling, etc. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation.*

*In many circumstances, a critical condition must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 C.F.R. § 130.7(c)(1)). The critical condition can be thought of as the "worst case" scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has 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.*

VTDEC used the combination of a lake water quality model (BATHTUB) and a watershed model (a land use export model) to calculate the loading capacity for Lake Memphremagog and identify phosphorus reductions needed. The models determined that a loading capacity of 89,752 lbs/yr will support attainment of the phosphorus criterion of 14 ppb (Table 10 of the TMDL report). Both the water quality model and land use export model represent commonly used modeling approaches for lake systems.

**Assessment:** EPA Region I concludes that the loading capacity has been appropriately set at a level necessary to attain and maintain applicable water quality standards for the lake. The TMDL is based on a reasonable and widely accepted approach for establishing the relationship between pollutant loading and water quality in lakes.

The loading capacity is expressed in terms of annual loads. EPA's November 15, 2006 guidance entitled "Establishing TMDL 'Daily' Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in *Friends of the Earth, Inc. v. EPA, et al.*, No.05-5015, (April 25, 2006) and Implications for NPDES Permits," recommends that TMDL submittals express allocations in terms of daily time increments. This guidance also acknowledges that the decision of the U.S. Court of Appeals for the Second Circuit, *NRDC v. Muszynski*, 268 F.3d 91 (2<sup>nd</sup> Cir. 2001), established the controlling legal precedent for cases brought in the Second Circuit, which includes Vermont. In this decision, the Court required a reasoned explanation for the choice of any particular non-daily load. EPA believes that VANR has provided a reasonable basis for not including daily loads in this TMDL. As the TMDL document makes clear, in-lake concentrations of phosphorus in a lake such as Lake Memphremagog are not affected by variations in daily inputs, but rather by long-term cumulative inputs over a season or more. In addition, the Vermont Water Quality Standards express the applicable phosphorus criterion in terms of annual mean total phosphorus concentrations. The expression of the loading capacity and load limits on an annual basis is therefore a logical and effective approach in this case.

#### **4. Margin of Safety (MOS)**

*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 C.F.R. § 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.*

VTDEC established an explicit margin of safety of 8% of the total loading capacity, or 7180 lbs/yr. The TMDL report indicates that this additional loading reduction will better ensure that the lake will attain the annual target of 14 ppb. This MOS takes into account the results of the lake modeling uncertainty analysis (which indicates a 2.8% model prediction error) and other uncertainties described in the TMDL report.

**Assessment:** EPA Region I concludes that with an explicit MOS of 8%, VTDEC has provided an adequate MOS for this TMDL.

## 5. Wasteload Allocations (WLAs)

*EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources (40 C.F.R. § 130.2(h) ). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero. If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.*

*In preparing the wasteload allocations, it is not necessary that each individual point source be assigned a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be assigned to the group of facilities. But it is necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.*

*The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the State/Tribe will need to demonstrate reasonable assurance that the nonpoint source reductions will occur within a reasonable time.*

The TMDL includes wasteload allocations for all NPDES permitted sources of phosphorus. Wastewater Treatment plant allocations are specified in Table 7, and represent an overall reduction in permitted loads of 33%. The TMDL also sets wasteload allocations for stormwater sources and CAFOs. The TMDL report explains that it was not technically feasible to separate the allocations for stormwater sources requiring NPDES permits from the allocations for other stormwater sources based on land use. Therefore, consistent with EPA guidance, the report indicates that VTDEC established an overall wasteload allocation for the developed land category. The developed land allocation was set with the aid of a Scenario Tool that allowed VTDEC to estimate the amount of phosphorus that would likely be reduced from developed land following the issuance of new statewide stormwater permits being developed pursuant to Vermont's Act 64. Both the developed land and CAFO wasteload allocations are specified in Table 10. The wasteload allocations were developed with an assumption that nonpoint source load reductions will also need to occur. The TMDL includes reasonable assurance that the nonpoint source reductions will occur, as discussed in Section 10, below.

**Assessment:** EPA Region I concludes that VTDEC has appropriately established wasteload allocations for all applicable sources, including wastewater treatment plants, developed land, and CAFOs.

## 6. Load Allocations (LAs)

*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 C.F.R. § 130.2(g) ). Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. § 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. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.*

VTDEC established load allocations for the nonpoint source categories of agricultural land, stream channel erosion, and forest land. The magnitudes of the allocations were set with the aid of a Scenario Tool that allowed VTDEC to determine phosphorus reduction amounts (and allocations) that were realistically achievable from each source category, and that also were sufficient to attain the lake loading capacity in combination with the wasteload allocations and the margin of safety. The allocations for each category are specified in Table 10 of the TMDL document. VTDEC also provided reasonable assurance that these allocations will be achieved, as discussed in Section 10 below.

**Assessment:** EPA Region I concludes that the load allocations are adequately specified in the TMDL at levels necessary to attain and maintain water quality standards.

## 7. Seasonal Variation

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

The Lake Memphremagog TMDL considered seasonal variations because the allowable annual load was developed to be protective of the most sensitive time of year – during the summer, when algae blooms are most severe. Thus, the TMDL is protective of all seasons.

**Assessment:** EPA Region I concludes that seasonal variation has been adequately accounted for in the TMDL because the TMDL was developed to be protective of the most environmentally sensitive period, the summer season. In addition, phosphorus controls are expected to be in place throughout the year so that these controls will reduce pollution whenever sources are active.

## 8. Monitoring Plan

*EPA's 1991 document, Guidance for Water Quality-Based Decisions: The TMDL Process (EPA 440/4-91-001), and EPA's 2006 guidance, Clarification Regarding "Phased" Total Maximum Daily Loads, recommend a monitoring plan when a TMDL is developed using the phased approach. The guidance indicates that a State may use the phased approach for situations where TMDLs need to be developed despite significant data uncertainty and where the State expects that the loading capacity and allocation scheme will be revised in the near future. EPA's guidance provides that a TMDL developed under the phased approach should include, in addition to the other TMDL elements, a*

*monitoring plan that describes the additional data to be collected, and a scheduled timeframe for revision of the TMDL.*

The TMDL report includes a monitoring section that describes three components of the Memphremagog water quality monitoring plan, including the on-going Lay Monitoring Program, the VTDEC tributary monitoring, and a targeted sampling program to help pinpoint sources and evaluate load reductions achieved. In addition, VTDEC will be tracking BMPs implemented through a basin-wide tracking tool.

**Assessment:** EPA Region I concludes that the monitoring plan components described above are sufficient to evaluate success of the TMDL and its implementation.

## **9. Implementation Plans**

*On August 8, 1997, Bob Perciasepe (EPA Assistant Administrator for the Office of Water) issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired solely or primarily by nonpoint sources. To this end, the memorandum asks that Regions assist States/Tribes in developing implementation plans that include reasonable assurances that the nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by EPA, they help establish the basis for EPA's approval of TMDLs.*

VTDEC prepared a tactical basin plan for Lake Memphremagog, concurrent with the development of the TMDL. The basin plan includes detailed actions necessary to attain the TMDL targets. Action items address reductions needed from all phosphorus sources. The basin plan will be updated every 5 years to allow for incorporation of new information and any needed adjustment of action strategies. While much of the necessary load reductions will be driven by new regulations, the basin plan provides an opportunity to target technical and financial resources to locations where the largest phosphorus reductions are possible.

**Assessment:** Addressed, though not required.

## **10. Reasonable Assurances**

*EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This information is necessary for EPA to determine that the load and wasteload allocations will achieve water quality standards.*

*In a water impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, States/Tribes are strongly encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in section 9, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in State/Tribe implementation plans and "may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs."*

The TMDL includes three main components that provide reasonable assurance that the necessary load reductions will occur and will be sufficient to meet the specified load allocations.

First, Vermont's Act 64 of 2015 includes a number of regulatory changes that will achieve significant phosphorus reductions in the Memphremagog watershed. The changes include:

- requirements for new permits to control runoff from state highways, local roads, and impervious parcels larger than 3 acres;
- changes to the Required Agricultural Practices addressing nutrient management planning, livestock exclusion, certification of manure applicators, new protections for riparian buffers, and many other changes;
- revisions to the Acceptable Management Practices for forestry strengthening runoff controls on forest roads and stream crossings;
- implementation of recently adopted rules controlling stream alteration and development in floodplains.

Second, Vermont's Act 64 and subsequent legislation provided ongoing additional funding of \$5.3 million per year for the Clean Water Fund, and additional funding has been directed to the Memphremagog clean-up through federal agencies such as \$674,000 from USDA over and above the regular USDA funding for agricultural practices.

Third, VTDEC developed a Scenario Tool that enabled the state to quantify the amount of phosphorus reduction realistically achievable from the measures contained in Act 64, and to determine that these reductions were sufficient to meet the load allocations.

Together, these factors provide assurance that the needed nonpoint source reductions can and will be achieved.

**Assessment:** Based on the components described above, EPA concludes that the TMDL includes reasonable assurance that the needed nonpoint source reductions will be achieved.

## **11. Public Participation**

*EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each State/Tribe must, therefore, provide for public participation consistent with its own continuing planning process and public participation requirements (40 C.F.R. § 130.7(c)(1)(ii) ). 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. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. § 130.7(d)(2) ). Inadequate public participation could be a basis for disapproving a TMDL; however, where EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.*

The public participation for the Lake Memphremagog TMDL is described on page 32 of the TMDL report and in the separate Responsiveness Summary to Public Comments submitted with the TMDL report. In addition to a variety of opportunities to provide input during TMDL development, an official comment period ran from May 16 through June 16, 2017. The comment period was noticed on the VTDEC website and through other venues. VTDEC also hosted three public meetings during this period to present the TMDL and to answer questions. VTDEC described the comments and VTDEC responses in the Responsiveness Summary document referred to above. The State made a number of adjustments to the final TMDL report in response to suggestions from commenters.



***Assessment:*** EPA Region I concludes that VTDEC has done an adequate job of involving the public during the development of the TMDL, provided adequate opportunities for the public to comment on the TMDL, and provided appropriate responses to the comments received.

<b>Data for entry in EPA's National TMDL Tracking System</b>							
TMDL Name		<b>Lake Memphremagog Phosphorus TMDL</b>					
Number of TMDLs*		1					
Type of TMDLs*		Nutrients (phosphorus)					
Number of listed causes (from 303(d) list)		1					
Lead State		VT					
TMDL Status		Final					
TMDL Segment name	TMDL Segment ID #	TMDL Pollutant ID# & name	TMDL Impairment Cause(s) <sup>+</sup>	Pollutant endpoint	Unlisted?	NPDES Point Source & ID#	Listed for anything else?
Lake Memphremagog	VT17-01L01	515 (Total Phosphorus)	515	14 ug/l phosphorus		VT0100072, VT0100641, VT0100200, VT0100251, GP-3-9007, GP-3-9020, VTR050001, GP-3-9040	
TMDL Type		Point and Nonpoint Sources					
Establishment Date (approval)*		Sep 28, 2017					
EPA Developed		No					
Towns affected*		Albany, Averys Gore, Barton, Brighton, Brownington, Charleston, Coventry, Craftsbury, Derby, Eden, Glover, Greensboro, Hardwick, Holland, Irasburg, Lowell, Morgan, Newport City, Newport Town, Newark, Sheffield, Sutton, Warners Grant, Warrens Gore, Westmore, Wolcott					