UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7
11201 Renner Boulevard
Lenexa, Kansas 66219

JUL 15 2014

Dr. Robert Moser
Secretary
Kansas Department of Health and Environment
1000 S.W. Jackson, Suite 540
Topeka, Kansas 66612-1368

Dear Dr. Moser:

RE: Approval of TMDL document for Milford Lake

This letter responds to the submission from the Kansas Department of Health and Environment, originally received by the U.S. Environmental Protection Agency, Region 7, on January 14, 2014, for a Total Maximum Daily Load document which contained TMDLs for total phosphorus and total nitrogen. Milford Lake was identified on the 2012 Kansas Section 303(d) list as impaired by eutrophication and low dissolved oxygen. This submission fulfills the Clean Water Act statutory requirement to develop TMDLs for impairments listed on a state's § 303(d) list. The specific impairments (water body segments and causes) are:

Water Body Name	WBID	Cause
Milford Lake	KS-KR-17-LM019001	Eutrophication, low Dissolved Oxygen

The EPA has completed its review of the TMDL document with supporting documentation and information. By this letter, the EPA approves the submitted TMDLs. Enclosed with this letter is the EPA Region 7 TMDL Decision Document which summarizes the rationale for the EPA's approval of the TMDLs. The EPA believes the separate elements of the TMDLs described in the enclosed document adequately address the causes of concern, taking into consideration seasonal variation and a margin of safety.

Although the EPA does not approve the monitoring or implementation plans submitted by the state, the EPA acknowledges the state's efforts. The EPA understands that the state may use the monitoring plan to gauge the effectiveness of the TMDL and determine if future revisions are necessary or appropriate to meet applicable water quality standards. The EPA recognizes that technical guidance and support are critical to determining the feasibility of and achieving the goals outlined in these TMDLs. Therefore, the implementation plan in this TMDL document provides information regarding implementation efforts to achieve the loading reductions identified.

The EPA is currently in consultation under Section 7 of the Endangered Species Act with the U.S. Fish and Wildlife Service regarding this TMDL document. While we are approving these TMDLs at the present time, we may decide that changes to the TMDL document are warranted based upon the results of the consultation when it is completed.

The EPA appreciates the thoughtful effort that the KDHE has put into these TMDLs. We will continue to cooperate with and assist, as appropriate, in future efforts by the KDHE, to develop TMDLs.

Sincerely,

Karen A. Flournoy
Director
Water, Wetlands and Pesticides Division

Enclosure

cc: Mr. John Mitchell, Director, Division of Environment, KDHE
Mr. Tom Stiles, Chief, Watershed Planning, Monitoring and Assessment Section, KDHE

EPA Region 7 TMDL Review

TMDL ID: KS-KR-17-LM019001 **State:** KS

Document Name: MILFORD LAKE

Basin(s): KANSAS-LOWER REPUBLICAN

HUC(s): 10250017

Water body(ies): MILFORD LAKE

Tributary(ies): BUFFALO CREEK, ELM CREEK, FIVE CREEK, MULBERRY CREEK (36), PEATS CREEK, REPUBLICAN RIVER, SALT CREEK, WOLF CREEK

Pollutant(s): EUTROPHICATION (NUTRIENTS/CHLOROPHYLL-A/TROPHIC STATE), LOW DISSOLVED OXYGEN

Submittal Date: 1/14/2014 **Approved:** Yes

Submittal Letter and Total Maximum Daily Load Revisions

The state submittal letter indicates final TMDL(s) for specific pollutant(s) and water(s) were adopted by the state, and submitted to the EPA for approval under Section 303(d) of the Clean Water Act [40 CFR § 130.7(c)(1)]. Include date submitted letter was received by the EPA, date of receipt of any revisions and the date of original approval if submittal is a revised TMDL document.

The Kansas Department of Health and Environment officially submitted the TMDL document for Milford Lake to the U.S. Environmental Protection Agency on January 14, 2014. Revisions were submitted by the KDHE in an email dated April 11 and May 26, 2014, in response to EPA comments dated March 26, 2014.

Water Quality Standards Attainment

The targeted pollutant is validated and identified through assessment and data. The water body's loading capacity for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. The TMDL(s) and associated allocations are set at levels adequate to result in attainment of applicable water quality standards [40 CFR § 130.7(c)(1)]. A statement that the WQS will be attained is made.

Milford Lake is listed in Category 5 - the Section 303(d) list - of the Surface Water Quality Integrated Report because its designated uses are impaired by eutrophication(2004 and 2012 Integrated Reports), and low dissolved oxygen (2002, 2004, 2008, 2010 and 2012 Integrated Reports) based on assessment data collected from monitoring sites within the lake by the KDHE and the United States Army Corp of Engineers. Excessive nutrient loads are contributing to objectionable algal blooms and low dissolved oxygen, thus impairing aquatic life, domestic water supply and primary contact recreation within Milford Lake.

Lake Monitoring Sites: The KDHE Station LM019001 in Milford Lake. Fifteen surveys conducted by the KDHE in calendar years 1976, 1980, 1982, 1988, 1991, 1994, 1996, 1997, 1998, 2000, 2003, 2006, 2009 and 2012. The USACE selected in-lake monitoring sites for their sampling in years ranging from 1996-2012.

Stream Data: There are eleven KDHE stream monitoring stations within the Milford Lake watershed, of which all but SC711 are listed as impaired on the 303(d) list for total phosphorus. Summary stream data are detailed in Table 8 of the TMDL document.

Stream Chemistry Monitoring Sites (period of record):
Station SC231 Republican River Near Hardy, Nebraska (1990-2012)
Station SC503 Republican River near Clay Center (1990-2012)
Station SC504 Republican River near Clay Center (rotational) (1990-2012)

Station SC509 Buffalo Creek near Concordia (1990-2012)
Station SC510 Republican River near Rice (1990-2012)
Station SC649 Peats Creek near Clifton (rotational) (1993-2011)
Station SC650 Salt Creek near Hollis (rotational) (1993-2009)
Station SC707 Wolf Creek near Concordia (rotational) (1994-2010)
Station SC709 Elm Creek near Ames (rotational) (1995-2011)
Station SC710 Mulberry Creek near Clifton (rotational) (1995-2011)
Station SC711 Five Creek near Clay Center (rotational) (1996-2012)

Flow Record:
The United States Geological Survey Gages:
Gage 06853500 Republican River near Hardy, Nebraska (1980-2012)
Gage 06856000 Republican River at Concordia, Kansas (1980-2012)
Gage 06856600 Republican River at Clay Center, Kansas (1980-2012)

Current Condition: The KDHE sampled the main basin of Milford Lake 15 times over the period of record, with the majority of the sampling events taking place during the summer months of June and July. The chlorophyll *a* concentration average over the entire period of record of the KDHE data for Milford Lake is 17.57 micrograms per liter. The more recent chlorophyll *a* concentration average for the KDHE samples obtained from 1996-2012 is 21.4 µg/L, and 67.9 µg/L in the 2012 survey. The USACE has sampled the main basin of Milford Lake 22 times since 2004. The USACE collected one to six samples between April and September during the years that they sampled the main basin. The annual average chlorophyll *a* concentration based on the USACE data in Milford Lake is 16.29 µg/L. Utilizing both the KDHE and the USACE main basin data, the annual average chlorophyll *a* concentration since 1996 in Milford Lake is 19.45 µg/L. The TMDL document includes the Carlson trophic state index of 57.01 as calculated from the average chlorophyll *a* concentration of 21.4 µg/L, and a TSI of 71.98 calculated from the current (2012) chlorophyll *a* reading of 67.9 µg/L. Based on this data and corresponding trophic indices, Milford lake is considered fully eutrophic to hypereutrophic.

Another indication of eutrophication and algal biomass were the Secchi depth transparency readings obtained by the KDHE in Milford Lake. Secchi depths had an annual average of 1.59 meters, with the lowest depth of 1.00 m observed in 1996 and the greatest depth of 2.42 m observed in 2006. The Secchi depth readings obtained by the USACE had an annual average of 1.32 m from 2005-2012. Figure 3 of the TMDL document details the annual average Secchi depth measurements within Milford Lake. The average turbidity value obtained by the KDHE in Milford Lake was 5.38 nephelometric turbidity units and ranged from 1.8 NTU to 10.45 NTU. The average total suspended solids concentration in Milford Lake was 6.52 milligrams per liter for the KDHE data and 6.98 mg/L for the USACE data over the entire period of record. The Carlson TSI value for Secchi depth of Milford Lake consistently indicates slightly to fully eutrophic conditions.

The average total nitrogen and total phosphorus concentrations over the entire period of record are 1.17 mg/L and 0.14 mg/L respectively for the KDHE sampling data. The USACE data yielded annual averages of 1.01 mg/L of TN and 0.20 mg/L of TP. The recent average TN and TP concentrations for the combined data sets since 1996 are 1.05 mg/L and 0.18 mg/L, respectively. The maximum TP concentration of 0.30 mg/L was observed in 1996. Data for calculating TN is not available prior to the 1994 sampling event and a maximum TN detection of 1.60 mg/L occurred in 2011. The annual average TP and TN concentrations within Milford Lake are detailed in Figures 4 and 5 of the TMDL document. The TSI value for total phosphorus in Milford Lake consistently indicates very eutrophic conditions.

The average dissolved oxygen concentrations, depths and average temperature of Milford Lake sampling sites are summarized in Table 10 of the TMDL document for the period of record. In the sampling years 1976, 1982, 1994, 1996, 1997, 1998, 2000, 2003 and 2006 Milford Lake had average dissolved oxygen excursions lower than the 5 mg/L Kansas water quality criterion at sampling depths averaging greater than 3 meters. The year 2000 was the only sampling year that had DO concentrations of less than 5 mg/L at the shallow, 0-3 meter depth range.

These data on nutrient concentrations, and the trophic response and DO concentrations in Milford Lake demonstrate that the lake is not meeting Kansas' water quality standards and criteria for nutrients and dissolved oxygen.

The KDHE used the USACE and the KDHE data (2008 - 2012) in water quality model simulations and assessment of eutrophication of Milford Lake. The KDHE used stream chemistry and flow data on the Republican River (2008-2012) and FLUX to calculate nutrient concentration inputs to the BATHTUB reservoir

model from stream inflows. The BATHTUB results for the current average lake condition and necessary TMDLs to achieve the endpoint/goal of 10 µg/L chlorophyll *a* and 5 mg/L or higher DO are detailed in Table 11 of the TMDL document.

Table 1. Milford Lake current average conditions and TMDL based on BATHTUB

Lake Inflow	Current Average Condition	TMDL Condition	Percent Reduction Required
TP – Annual Load (tons/year)	1,216,912	148,341	88
TP – Lake Concentration (µg/L)	287	83.3	71
TN – Annual Load (tons/year)	4,875,835	674,882	86
TN – Lake Concentration (µg/L)	1722	427.8	75

TMDL Calculation: The impairments caused by eutrophication and low dissolved oxygen are addressed collectively by the development of a TMDL document that limits the TP and TN loads to Milford Lake. Based on the relationships between eutrophication and results of BATHTUB modeling, the TP loading capacity for Milford Lake is established at 148,341 pounds per year (772 pounds per day), and the TN loading capacity is established at 674,882 lb/yr (2866 lb/day). To meet the target loads, overall reductions of 88 percent and 86 percent of the currently modeled TP and TN loads are required, respectively. The TP and TN loads from the watershed were calculated using FLUX. In-lake water quality responses were simulated using the BATHTUB model.

TMDL = Loading Capacity = Σ WLA + Σ LA + MOS

The LC, expressed as the allowable annual average, which is more useful than the daily load for water quality assessment and watershed planning and management, is as follows:

LC for TP = Σ WLA (15,220 lb-TP/year) + Σ LA (118,287 lb-TP/year) + MOS (14,834 lb-TP/year)
= 148,341 lb-TP/year

LC for TN = Σ WLA (81,432 lb-TN/year) + Σ LA (525,962 lb-TN/year) + MOS (67,488 lb-TN/year)
= 674,882 lb-TN/year

To translate the long-term allowable average growing season loads to maximum daily loads, the KDHE used an EPA-supported approach described in the Technical Support Document for Water Quality Based Toxics Control:

Maximum Daily Load = (Long-Term Average Load) * $e^{[Z\sigma - 0.5\sigma^2]}$
where:
$\sigma^2 = \ln(CV^2 + 1)$
CV = Coefficient of variation = Standard Deviation / Mean
Z = 2.326 for 99th percentile probability basis

TMDL for TP = LC = Σ WLA (42 lb-TP/day) + Σ LA (653 lb-TP/day) + MOS (77 lb-TP/day) = 772 lb-TP/day

TMDL for TN = LC = Σ WLA (223 lb-TN/day) + Σ LA (2356 lb-TN/day) + MOS (287 lb-TN/day)
= 2866 lb-TN/day

The EPA concurs that meeting the TMDL targets will result in the attainment of water quality standards for Milford Lake.

Designated Use(s), Applicable Water Quality Standard(s) and Numeric Target(s)

The submittal describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria, and a numeric target. If the TMDL(s) is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

Milford Lake Designated Uses: Expected Aquatic Life; Primary Contact Recreation Class A; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply; Irrigation and Livestock Watering.

Water Quality Criteria:
The introduction of plant nutrients into streams, lakes, or wetlands from artificial sources shall be controlled to prevent the accelerated succession or replacement of aquatic biota or the production of undesirable quantities or kinds of aquatic life (K.A.R. 28-16-28e(c)(2)(A)).

The introduction of plant nutrients into surface waters designated for domestic water supply use shall be controlled to prevent interference with the production of drinking water (K.A.R. 28-16-28e(c)(3)(D)).

The introduction of plant nutrients into surface waters designated for primary or secondary contact recreational use shall be controlled to prevent the development of objectionable concentrations of algae or algal by-products or nuisance growths of submersed, floating, or emergent aquatic vegetation (K.A.R. 28-26-28e(c)(7)(A)).

The concentration of dissolved oxygen in surface waters shall not be lowered by the influence of artificial sources of pollution. The Dissolved Oxygen criterion is 5 milligrams per liter (K.A.R. 28-16-28e(d), Table 1g).

A chlorophyll *a* endpoint of 10 µg/L is the statewide goal for federal lakes and lakes serving as public water supplies. The target to support primary contact recreation and all other uses of Milford Lake will be to maintain average summer chlorophyll *a* concentrations below 10 micrograms per liter.

Attaining the chlorophyll *a* endpoint will also result in dissolved oxygen concentrations meeting or exceeding 5 mg/L throughout the water column of the lake. Expected aquatic life support and all other uses have been considered and are protected at the 5.0 milligrams per liter numeric dissolved oxygen target.

Pollutant(s) of Concern

A statement that the relationship is either directly related to a numeric water quality standard, or established using surrogates and translations to a narrative WQS is included. An explanation and analytical basis for expressing the TMDL(s) through surrogate measures, or by translating a narrative water quality standard to a numeric target is provided (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae). For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and a margin of safety that do not exceed the loading capacity. If the submittal is a revised TMDL document, there are refined relationships linking the load to water quality standard attainment. If there is an increase in the TMDL(s), there is a refined relationship specified to validate that increase (either load allocation or wasteload allocation). This section will compare and validate the change in targeted load between the versions.

There is an established link between the narrative water quality standards for nutrients and numeric total nitrogen and total phosphorus targets. In eutrophication impairments, chlorophyll *a* concentrations are used as a translator in measuring algal growth and the extent of nutrient enrichment and excursions of narrative WQS. Excess phosphorus and nitrogen enters surface waters and results in eutrophication stimulating blooms of algae and undesirable weeds. As the biomass respires, dissolved oxygen in the water column fluctuates and may result in excursions of the WQS for dissolved oxygen. Decomposition of dead algae and other plant material also lowers the dissolved oxygen concentrations in the lake.

The ratio of total nitrogen to total phosphorus is commonly used to determine which nutrient is limiting plant growth in Kansas aquatic ecosystems. Typically, lakes that are nitrogen limited have a water column TN:TP ratio less than 8; lakes that are co-limited by nitrogen and phosphorus have a TN:TP ratio between 9 and 21; and lakes that are phosphorus limited have a water column TN:TP ratio greater than 21. Milford Lake has varied between being co-limited by phosphorus and nitrogen (in 1994, 1997, 1998, 2000, 2008 and 2011surveys) and being limited by only nitrogen (in 1996, 2001, 2002, 2003, 2004, 2005, 2006, 2009, 2010 and 2012 surveys). During either limitation, the chlorophyll *a* concentrations within the main basin of the lake exceeded the 10 micrograms per liter target established by the KDHE, and therefore both total phosphorus and total nitrogen allocations are established in the TMDL document. The TN, TP and the chlorophyll *a* endpoint are established translators of the narrative nutrient water quality standards and criteria.

As described on pages 23-24 of the TMDL document, total nitrogen and total phosphorus loads were modeled using BATHTUB to determine load allocations needed to meet the numeric target of 10 µg/L chlorophyll *a*, and to meet the dissolved oxygen criterion of 5 milligrams per liter. The numeric DO target criterion directly relates to attaining the aquatic life designated use of Milford Lake protected by Kansas' WQS.

The BATHTUB model is an empirical receiving water quality model developed by the U.S. Army Corps of Engineers, and it has been widely used to establish numeric TMDLs for morphometrically complex lakes and

reservoirs. The BATHTUB model was utilized for the eutrophication assessment of Milford Lake and for the development of TMDLs. Milford Lake was subdivided into five segments for BATHTUB modeling, which includes the riverine, upper pool (transitional area), middle pool (transitional area), main basin and a cove area near the main basin. Water quality data from the main basin segment was averaged using the KDHE and the USACE data from 2008-2012. Data associated with riverine and mid-pool were collected only by the USACE from 2008-2012. Model input data for the lake inflow from the Republican River were estimated using the USACE's FLUX calculator, utilizing the KDHE monitoring data from station SC503 and the U.S. Geological Survey flow data from gage 06856600 on the Republican River near Clay Center. Inflowing TP and TN concentrations in unmonitored tributaries flowing into the lake were estimated utilizing data from station SC711 and flows derived from USGS estimates. Atmospheric total nitrogen was obtained from the Clean Air Status and Trends Network, which is available at www.epa.gov/castnet. The CASTNET station from the Konza Prairie was utilized to estimate the atmospheric TN concentration for the model. Total Phosphorus atmospheric loading was estimated using a 1983 study.

Based on the BATHTUB model results, total phosphorus and total nitrogen stream concentrations entering the lake must be reduced by 88 percent. These reductions at the inflow will result in a 71 percent reduction of TP, 75 percent reduction of TN and a 68 percent reduction and the attainment of the 10 µg/L endpoint for chlorophyll *a* within the lake. Attainment of the endpoint indicates TP and TN loads are within the loading capacities for the lake, and the narrative nutrient and numeric DO WQS and criteria are met.

Source Analysis

Important assumptions made in developing the TMDL document, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, nonpoint and background sources of pollutants of concern are described, including magnitude and location of the sources. The submittal demonstrates all significant sources have been considered. If this is a revised TMDL document any new sources or removed sources will be specified and explained.

In the absence of a national pollutant discharge elimination system permit, the discharges associated with sources were applied to the load allocation, as opposed to the wasteload allocation for purposes of this TMDL document. The decision to allocate these sources to the LA does not reflect any determination by the EPA as to whether these discharges are, in fact, unpermitted point source discharges within this watershed. In addition, by establishing these TMDL(s) with some sources treated as LAs, the EPA is not determining that these discharges are exempt from NPDES permitting requirements. If sources of the allocated pollutant in this TMDL document are found to be, or become, NPDES-regulated discharges, their loads must be considered as part of the calculated sum of the WLAs in this TMDL document. Any WLA in addition to that allocated here is not available.

The predominant land uses in the Milford Lake watershed include 50.3 percent cropland, 37.05 percent grassland, 4.54 percent forest and 4.04 percent roadways. These and the remaining land use percentages and acres for the watershed were summarized from the 2001 National Land Cover Database and included in Table 16 of the TMDL document.

Contributing Runoff: The watershed of Milford Lake has a mean soil permeability of 1.16 inches/hour. About 65 percent of the watershed has a permeability value less than 1.14 inches/hour, which contributes to runoff during very low rainfall intensity events. Over 95 percent of the watershed has a permeability value less than 1.29 inches/hour. Runoff is primarily generated when rainfall intensities are greater than soil permeability. As the watershed's soil profiles become saturated, excess overland flow is produced.

Water Diversions: There are 2,308 unique points of diversion in the five counties within the watershed. The leading use of water in Riley County is municipal use, and irrigation is the leading use for all other counties within the watershed. Geary and Jewell Counties have the fewest points of diversions and Clay, Cloud, Washington and Republic all have the highest number of points of diversions as seen in Table 17 of the TMDL document. Figure 19 of the TMDL document shows that the majority of the points of diversion all are in close proximity to the Republican River or its tributaries.

Background: Phosphorus is naturally found in rocks, soil and organic material and is essential for the growth of aquatic and terrestrial vegetation including agricultural crops. The natural erosion of soil contributes to the background phosphorus and nitrogen which becomes available to the ecosystem. However, human activities and practices may cause excessive erosion during runoff events within the watershed and contribute to higher levels of sediment and attached nutrients. Land use impacts such as the removal of riparian forests and wetlands,

streambank erosion, urbanization and agricultural activities, including manure and commercial fertilizer application to cropland, may significantly increase the levels of total phosphorus and nitrogen reaching aquatic ecosystems. The levels of phosphorus and nitrogen in watershed streams have been significantly increased due to human activities, land use changes and practices, and therefore it is difficult to estimate the actual background phosphorus concentrations within the Milford Lake watershed. The atmospheric deposition of nutrients on the watershed contribute a relatively small amount of the nutrient load. Wildlife inhabitants of the watershed, particularly in areas near the lake and stream corridors, may contribute to the nutrient load in the watershed; however, the nutrient contribution of wildlife is considered insignificant.

Internal Loading: Nutrients bound to soil particles in the inflow to Milford Lake are potentially significant sources of nutrients initially residing in the sediment layer of the lake. Sediment bound nutrients can be released and re-suspended and continue to add to the eutrophication of Milford Lake. Internal loading of nutrients is a complex function of lake chemical and biological conditions, lake morphometry and sediment nutrient availability.

Population Density: According to the 2010 census data from the U.S. Census Bureau, the population of the entire watershed is approximately 21,291 people, and therefore the population density for the watershed is approximately 9.73 people/square mile. There are numerous municipalities within the watershed that are detailed in Table 14 of the TMDL document and account for 18,032 people within the watershed. The population trends for the majority of the cities within the watershed indicate stable or declining populations. The cities of Wakefield, Milford and Palmer are the only three cities within the watershed with increased population between the 2000 and 2010 Census; the city of Wakefield experienced the highest growth rate.

On-Site Waste Treatment Systems: Households outside of the municipalities that operate a wastewater treatment facility are presumably utilizing on-site septic systems. There are approximately 18,032 people living within the municipalities served by wastewater treatment facilities within the watershed, and therefore there are approximately 3,259 people within the watershed utilizing on-site septic systems. Significant nutrient loading may occur if a system fails and it is located near a stream. However, based on the size of this watershed it is likely that on-site septic systems are an insignificant source contributing to the impairment within the Milford Lake watershed.

Point Sources: There are 44 permitted facilities within the Milford Lake watershed. The National Pollutant Discharge Elimination System facilities within the Milford Lake watershed are listed in Appendix D of the TMDL document. Of these facilities, there are 17 that are non-discharging facilities and 26 permitted discharging facilities. Of the discharging facilities, there are 11 permitted municipal facilities and 15 industrial facilities. Of the discharging facilities, there are 9 permits that require nutrient monitoring since they may be sources and contributors to the impairments of Milford Lake. These facilities along with their average discharge flow, average effluent total phosphorus concentration and their average effluent total nitrogen concentrations are listed in Table 12 of the TMDL document.

The non-overflowing permitted facilities are prohibited from discharging, but potentially contribute a nutrient load under extreme precipitation or flooding events. Such events and overflows don't occur frequently, and are not considered to be a significant contributor to the causes of impairment of Milford Lake.

Livestock Waste Management Systems: There are 184 certified or permitted concentrated animal feeding operations within the Milford Lake watershed. Facilities and permit numbers are tabulated in Appendix C of the TMDL document. Although the total potential number of animals is approximately 286,571 head in the watershed, the actual number of animals at the feedlot operations is typically less than the allowable permitted number. All of these livestock facilities have waste management systems designed to minimize runoff entering their operation and detain runoff emanating from their facilities. These facilities are designed to retain a 25-year, 24-hour rainfall/runoff event as well as an anticipated two weeks of normal wastewater from their operations.

According to Kansas Agricultural Statistics the estimated number of all cattle, calves and hogs for counties that are within the watershed as of January 1, 2010, and 2011 are detailed in Table 15 of the TMDL document. The animal waste from both confined and unconfined feeding sites is considered a possible major source of nutrient loading into Milford Lake. Of particular concern are lands near the riparian areas that are subject to livestock grazing or watering and fertilizer applications.

Any concentrated animal feeding operation that does not obtain an NPDES permit must operate as a no discharge operation. Any discharge from an unpermitted CAFO is a violation of Section 301 of the Clean Water Act. It is the EPA's position that all CAFOs should obtain an NPDES permit because it provides clarity of compliance

requirements, authorization to discharge when the discharges are the result of large precipitation events such as in excess of the 25-year and 24-hour frequency/duration event or are from a man-made conveyance.

Any NPDES-permitted CAFOs identified in this TMDL document are part of the assigned wasteload allocation. Animal feeding operations and unpermitted CAFOs are considered under the load allocation because there is currently not enough detailed information to know whether these facilities are required to obtain NPDES permits. This TMDL document does not reflect a determination by the EPA that such a facility does not meet the definition of a CAFO nor that the facility does not need to obtain a permit. To the contrary, a CAFO that discharges or proposes to discharge has a duty to obtain a permit. If it is determined that any such operation is a CAFO that discharges, any future WLA assigned to the facility must not result in an exceedance of the sum of the WLAs in this TMDL document as approved.

As submitted, the TMDL document has a complete listing of all known sources of pollutant causes of impairment.

Allocation - Loading Capacity

The submittal identifies appropriate loading capacities, wasteload allocations for point sources and load allocations for nonpoint sources. If no point sources are present, the WLA is stated as zero. If no nonpoint sources are present, the LA is stated as zero [40 CFR § 130.2(i)]. If this is a revised TMDL document the change in loading capacity will be documented in this section. All TMDLs must give a daily number. Establishing TMDL "daily" loads consistent with the U.S. Court of Appeals for the D.C. circuit decision in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015, (April 25, 2006).

Since Milford Lake has varied between being co-limited by phosphorus and nitrogen and being limited by only nitrogen, and Chlorophyll *a* concentrations within the main basin of the lake have been greater than 10 micrograms per liter during either limitation, allocations are established in the TMDL document for both total phosphorus and total nitrogen.

The BATHTUB model was calibrated for the area-weighted mean of the nutrient data per the EPA's guidance. The model results estimate that the lake currently retains 75 percent of the total phosphorus and 52 percent of the total nitrogen load annually. Based on the modeling results, an 88 percent reduction of the TP and TN concentrations within the stream inflows of the lake are necessary to meet the TMDLs.

A summary of the Milford Lake TMDL document's load allocations are listed in Table 19 of the TMDL document as follows:

Description	Allocations (pounds per year)	Allocations (pounds per day)
Phosphorus Atmospheric Load Allocation	1388.9	7.23
Phosphorus Nonpoint Source Load Allocation	116,897.6	646.04
Phosphorus Wasteload Allocation	15,220.5	41.7
Phosphorus Margin of Safety	14,834.1	77.22
Phosphorus TMDL	148,341.2	772.19
Nitrogen Atmospheric Load Allocation	96,807.1	411.1
Nitrogen Nonpoint Source Load Allocation	429,155.4	1945.1
Nitrogen Wasteload Allocation	81,431.5	223.1
Nitrogen Margin of Safety	67,488.2	286.6
Nitrogen TMDL	674,882.2	2865.9

Wasteload Allocation Comment

The submittal lists individual wasteload allocations for each identified point source [40 CFR § 130.2(h)]. If a WLA is not assigned it must be shown that the discharge does not cause or contribute to a water quality standard excursion, the source is contained in a general permit addressed by the TMDL, or extenuating circumstances exist which prevent assignment of individual WLA. Any such exceptions must be explained to a satisfactory degree. If a WLA of zero is assigned to any facility it must be stated as such [40 CFR § 130.2(i)]. If this is a revised TMDL document, any differences between the original TMDL(s) WLA and the revised WLA will be documented in this section.

Wasteload allocations are established for the discharging wastewater treatment facilities permitted within the watershed. There are thirteen facilities that have been assigned a WLA, of which two are industrial facilities and eleven are municipal facilities. Of these, the largest wasteload allocations are associated with the cities of Concordia, Clay Center and Belleville. Wasteload allocations for mechanical plants have been assigned based on an annual average discharge concentration of 1.5 milligrams per liter total phosphorus and 8 mg/L total nitrogen at their respective design flows. The facilities that have not monitored nutients utilize lagoon systems, and have been assigned an annual average discharge concentration of 2.0 mg/L of TP and 8.0 mg/L of TN, which are concentrations typically observed in the effluent of lagoon systems in Kansas. The Nesika Energy facility discharges low concentrations of TP, and their WLA has been based on a TP concentration of 0.5 mg/L. The Valley Fertilizer industrial facility has been assigned a WLA for nitrate nitrogen based on the domestic waters supply use water quality standard of 10 mg/L. The wasteload allocations for Milford Lake are 41.7 pounds per day of TP and 223.1 lb/day of TN. The discharging facilities with an assigned WLA are detailed in Table 18 of the TMDL document. All other permitted facilities in the watershed are not contributing to the impairment within the Milford Lake watershed and have been assigned a WLA of 0 lb/day.

Load Allocation Comment

All nonpoint source loads, natural background and potential for future growth are included. If no nonpoint sources are identified, the load allocation must be given as zero [40 CFR § 130.2(g)]. If this is a revised TMDL document, any differences between the original TMDL(s) LA and the revised LA will be documented in this section.

Nonpoint sources are the main contributor of the nutrient input and impairment of Milford Lake. The monitoring, modeling and assessment indicate that nutrient loads associated with livestock operations, pastures, and cultivated crops contribute to the eutrophic condition of Milford Lake. Atmospheric deposition of nutrients is also considered a nonpoint source. Background and internal loading may be attributed to wildlife, leaf litter and nutrient cycling from in-lake sediments. Allowable nutrient load allocations for Milford Lake were calculated using the BATHTUB model, and the results are a total phosphorous nonpoint source LA of 118,286.5 pounds per year (653.27 pounds per day), and a total nitrogen NPS LA of 525,962.5 lb/yr (1346.2 lb/day).

Margin of Safety

The submittal describes explicit and/or implicit margins of safety for each pollutant [40 CFR § 130.7(c)(1)]. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided. If this is a revised TMDL document, any differences in the MOS will be documented in this section.

The margin of safety provides some hedge against the uncertainty of variable annual available phosphorus and nitrogen loads along with the chlorophyll *a* endpoint. Therefore, the MOS is explicitly set at 10 percent of the total allocations for the available phosphorus and nitrogen, which compensates for the lack of certainty about the relationship between the allocated loadings and the resulting water quality response. The margin of safety for available phosphorus and nitrogen is 77.22 pounds per day and 286.6 lb/day, respectively.

Seasonal Variation and Critical Conditions

The submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s) [40 CFR § 130.7(c)(1)]. Critical conditions are factors such as flow or temperature which may lead to the excursion of the WQS. If this is a revised TMDL document, any differences in conditions will be documented in this section.

Seasonal variation has been incorporated into this TMDL document since the peaks of algal growth occur in the summer months and the monitoring data that the TMDLs are based upon were collected seasonally. Excursions from the 5 milligrams per liter dissolved oxygen criterion may be attributed to warm weather as well, which supports higher microbial respiration in the lake water column and/or sediment. Decomposition of dead algae and other plant material may lower the dissolved oxygen concentrations near the bottom of the lake.

Public Participation

The submittal describes required public notice and public comment opportunities, and explains how the public comments were considered in the final TMDL(s) [40 CFR § 130.7(c)(1)(ii)].

Basin Advisory Committee: The Kansas Lower Republican Basin Advisory Committee met to discuss the TMDLs of the basin on March 17, 2011, in Manhattan, June 16, 2011, in Lawrence, September 29, 2011, in Topeka and October 16, 2013, in Manhattan.

Public Notice: An active internet website was established at http://www.kdheks.gov/tmdl/index.htm to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Kansas Lower Republican Basin.

Public Hearing: A Public Hearing on the Kansas Lower Republican TMDLs was held on December 11, 2013 in Junction City to receive comments on this TMDL document.

A comment letter was received from the Friends of the Kaw. The letter was supportive of the TMDL document and noted the need to develop numeric criteria for phosphorus and nitrogen. The KDHE responded to the letter, but no revisions to the TMDL document were necessary.

Monitoring Plan for TMDL(s) Under a Phased Approach

The TMDL identifies a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of water quality standards, and a schedule for considering revisions to the TMDL(s) (where a phased approach is used) [40 CFR § 130.7]. If this is a revised TMDL

document, monitoring to support the revision will be documented in this section. Although the EPA does not approve the monitoring plan submitted by the state, the EPA acknowledges the state's efforts. The EPA understands that the state may use the monitoring plan to gauge the effectiveness of the TMDLs and determine if future revisions are necessary or appropriate to meet applicable water quality standards.

The KDHE will continue to collect samples every three years from Milford Lake in order to assess the trophic state, with the next round of sampling to be conducted in 2015. Monitoring will also continue at the KDHE stream monitoring stations within the watershed to assess the nutrient load contributions from the respective monitoring stations. The Kansas City Corps of Engineers Office will continue to collect samples in Milford Lake on a monthly basis between April and October. Additionally, tracking the nutrient loads from point sources should be done to determine their contributions to the watershed and lake. The expected improved status of Milford Lake will be evaluated in 2019.

The KDHE expects to evaluate Milford Lake based on monitoring data collected from 2013-2021 and will reassess the lake in the preparation of the 2024 Integrated Report and § 303(d) list. Should revisions be made to the applicable water quality criteria for Milford Lake during the implementation period and evaluation for delisting, desired endpoints of this TMDL document and implementation activities might be amended.

The year 2019 marks the next cycle of 303(d) activities in the Kansas Lower Republican Basin to review data in the Milford Lake watershed to assess conditions and develop necessary instream phosphorus TMDLs in the Republican River and its tributaries. Should the impairment in the lake continue, adjustments to the source assessment, allocations and implementation activities may occur through the TMDL developed for streams within the watershed.

Reasonable Assurance

Reasonable assurance only applies when less stringent wasteload allocation are assigned based on the assumption that nonpoint source reductions in the load allocation will be met [40 CFR § 130.2(i)]. This section can also contain statements made by the state concerning the state's authority to control pollutant loads. States are not required under Section 303(d) of the Clean Water Act to develop TMDL implementation plans and the EPA does not approve or disapprove them. However, this TMDL document provides information regarding how point and nonpoint sources can or should be controlled to ensure implementation efforts achieve the loading reductions identified in this TMDL document. The EPA recognizes that technical guidance and support are critical to determining the feasibility of and achieving the goals outlined in this TMDL document. Therefore, the discussion of reduction efforts relating to point and nonpoint sources can be found in the implementation section of the TMDL document, and are briefly described below.

The states have the authority to issue and enforce state operating permits. Inclusion of effluent limits into a state operating permit and requiring that effluent and instream monitoring be reported to the state should provide reasonable assurance that instream water quality standards will be met. Section 301(b)(1)(C) requires that point source permits have effluent limits as stringent as necessary to meet WQS. However, for wasteload allocations to serve that purpose, they must themselves be stringent enough so that (in conjunction with the water body's other loadings) they meet WQS. This generally occurs when the TMDL(s)' combined nonpoint source load allocations and point source WLAs do not exceed the WQS-based loading capacity and there is reasonable assurance that the TMDL(s)' allocations can be achieved. Discussion of reduction efforts relating to nonpoint sources can be found in the implementation section of the TMDL document.

The following authorities may be used to direct activities in the watershed to reduce pollution:

1. K.S.A. 65-164 and 165 empowers the Secretary of the KDHE to regulate the discharge of sewage into the waters of the state.

2. K.S.A. 65-171d empowers the Secretary of the KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.

3. K.S.A. 2002 Supp. 82a-2001 identifies the classes of recreation use and defines impairment for streams.

4. K.A.R. 28-16-69 through 71 implements water quality protection by the KDHE through the establishment and administration of critical water quality management areas on a watershed basis.

5. K.S.A. 2-1915 empowers the Division of Conservation to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.

6. K.S.A. 75-5657 empowers the Division of Conservation to provide financial assistance for local project work plans developed to control nonpoint source pollution.

7. K.S.A. 82a-901, et. seq. empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.

8. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*, including selected Watershed Restoration and Protection Strategies.

9. The *Kansas Water Plan* and the Kansas Lower Republican River Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority in implementation.

10. K.S.A. 32-807 authorized the Kansas Department of Wildlife and Parks to manage lake resources.

Funding: The State Water Plan Fund annually generates $16-18 million and is the primary funding mechanism for implementing water quality protection and pollution reduction activities in the state through the Kansas Water Plan. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watersheds and water resources of highest priority. Typically, the state allocates at least 50 percent of the fund to programs supporting water quality protection through the WRAPS program. This watershed and its TMDLs are a high priority consideration for funding.

Desired Implementation activities for agriculture:

1. Implement soil sampling to recommend appropriate fertilizer applications on cultivated croplands to ensure excess nutrients are not being applied.

2. Maintain conservation tillage and contour farming to minimize cropland erosion.

3. Promote and adopt continuous no-till cultivation to increase the amount of water infiltration and minimize cropland soil erosion and nutrient transports.

4. Install grass buffer strips along streams and drainage channels in the watershed.

5. Reduce land disturbance activities within riparian areas.

6. Implement nutrient management plans to manage manure land applications and runoff potential.

7. Adequately manage fertilizer utilization in the watershed and implement runoff control measures.

8. Install pasture management practices, including proper stock density to reduce soil erosion and storm runoff.

9. Renew state and federal permits and inspect permitted facilities for permit compliance.

10. Utilize state-supported Milford Lake WRAPS process to coordinate load reduction of nutrients to the lake.

Nutrient control in Kansas watersheds has been proven effective through conservation tillage, contour farming and use of grass waterways and buffer strips. In addition, the proper implementation of comprehensive livestock waste management plans has proven effective at reducing nutrient runoff associated with livestock facilities. The key to success will be widespread utilization of conservation farming and proper livestock waste management systems within the Milford Lake watershed.