UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF

JUN 1 9 2019

WW-16J

Angela Brown
Chief, Watershed Planning & Restoration Section
Office of Water Quality, Indiana Department of Environmental Management
MC 65-42 Shadeland
100 North Senate Avenue
Indianapolis, Indiana 46204-2251

Dear Ms. Brown:

The U.S. Environmental Protection Agency approved the Indiana Department of Environmental Management (IDEM) Otter Creek Watershed (OCW) Total Maximum Daily Load (TMDL) report on September 20, 2013. In December 2017, IDEM informed EPA that it had found inaccuracies in IDEM's final OCW TMDL report submitted to EPA in the summer of 2013. More specifically, IDEM explained that it had mischaracterized how it calculated bacteria TMDLs in its final OCW TMDL report. IDEM confirmed that these inaccuracies were solely in the main body of the final OCW TMDL report and that the bacteria TMDL calculations presented in the final OCW TMDL report were correct.

EPA is revising its September 20, 2013 Decision Document in response to IDEM's December 2017 update on information included in the final OCW TMDL report. EPA's amendment to the Decision Document is explained in Attachment #1 to the June 2019 revision to the OCW TMDLs Decision Document.

EPA is enclosing the June 2019 revised Decision Document and Attachment #1 for IDEM's records. If you have any questions, please contact Mr. David Werbach, TMDL Coordinator, at 312-886-4242.

Sincerely,

David Pfeifer

David Pfeifer
Acting Branch Chief
Watersheds & Wetlands Branch

TMDL: Otter Creek Watershed, Clay, Parke and Vigo Counties, Indiana
Date: June 19, 2019 (revised)

DECISION DOCUMENT
FOR THE OTTER CREEK WATERSHED TMDL, INDIANA

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. Part 130 describe the statutory and regulatory requirements for approvable TMDLs. Additional 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. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable. These TMDL review guidelines are not themselves regulations. They are an attempt to summarize and provide guidance regarding currently effective statutory and regulatory requirements relating to TMDLs. Any differences between these guidelines and EPA's TMDL regulations should be resolved in favor of the regulations themselves.

1. Identification of Waterbody, Pollutant of Concern, Pollutant Sources, and Priority Ranking

The TMDL submittal should identify the water body as it appears on the State's/Tribe's 303(d) list. The water body should be identified/georeferenced using the National Hydrography Dataset (NHD), and the TMDL should clearly identify the pollutant for which the TMDL is being established. In addition, the TMDL should identify the priority ranking of the water body and specify the link between the pollutant of concern and the water quality standard (see Section 2 below).

The TMDL submittal should include an identification of the point and nonpoint sources of the pollutant of concern, including location of the source(s) and the quantity of the loading, e.g., lbs/per day. The TMDL should provide the identification numbers of the NPDES permits within the water body. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of the natural background. This 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 spatial extent of the watershed in which the impaired water body is located;
(2) the assumed distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;
(4) present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and
(5) an 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; chlorophyll a and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comment:

Location Description/Spatial Extent:

The Otter Creek Watershed (OCW) is located in west-central Indiana in Clay, Parke, and Vigo Counties. The OCW is approximately 124 square miles in size (approx. 79,360 acres). The headwaters of Otter Creek are in northern Clay County and the creek flows in a southwesterly direction through the OCW ultimately emptying into the Wabash River near Terre Haute, Indiana. The OCW TMDLs address impaired reaches on approximately 212-miles of streams within the OCW and target impaired segments in tributaries to the main stem of Otter Creek. These segments have been identified as violating water quality standards (WQS) for bacteria (*Escherichia coli* (*E. coli*)).

For the purposes of the OCW TMDL, the project area was subdivided into six Hydrologic Unit Code (HUC) twelve (HUC-12) watersheds;

- Headwaters Otter Creek (050120111-04-01);
- North Branch Otter Creek (050120111-04-02);
- Little Creek – North Branch Otter Creek (050120111-04-03);
- Sulphur Creek (050120111-04-04);
- Gundy Ditch (050120111-04-05); and
- Wastewaters Creek - Otter Creek (050120111-04-06).

Impaired segments within the boundaries of the six HUC-12 subwatersheds are listed in Table 1 of this Decision Document.

Table 1: Summary of Impairments in the Otter Creek Watershed and TMDL Count

2014 AUID	Impaired Beneficial Use	Action	Bacteria TMDL
Headwaters Otter Creek Subwatershed (05120111-04-01)			
INB1141_01	Recreation Use (bacteria)	Bacteria TMDL	1
North Branch Otter Creek Subwatershed (05120111-04-02)			
INB1142_01	Recreation Use (bacteria)	Bacteria TMDL	1
INB1142_01A	Recreation Use (bacteria)	Bacteria TMDL	1
INB1142_01B	Recreation Use (bacteria)	Bacteria TMDL	1
INB1142_01C	Recreation Use (bacteria)	Bacteria TMDL	1
INB1142_T1001	Recreation Use (bacteria)	Bacteria TMDL	1
INB1142_T1003	Recreation Use (bacteria)	Bacteria TMDL	1
INB1142_T1004	Recreation Use (bacteria)	Bacteria TMDL	1
INB1142_T1005	Recreation Use (bacteria)	Bacteria TMDL	1
Little Creek - North Branch Otter Creek Subwatershed (05120111-04-03)			
INB1143_01	Recreation Use (bacteria)	Bacteria TMDL	1
INB1143_T1001	Recreation Use (bacteria)	Bacteria TMDL	1
INB1143_T1001A	Recreation Use (bacteria)	Bacteria TMDL	1
INB1143_T1002	Recreation Use (bacteria)	Bacteria TMDL	1
Sulfur Creek Subwatershed (05120111-04-04)			
INB1144_01	Recreation Use (bacteria)	Bacteria TMDL	1
INB1144_T1001	Recreation Use (bacteria)	Bacteria TMDL	1

INB1144_T1001A	Recreation Use (bacteria)	Bacteria TMDL	1
Gundy Ditch Subwatershed (05120111-04-05)			
INB1145_01	Recreation Use (bacteria)	Bacteria TMDL	1
INB1145_T1001	Recreation Use (bacteria)	Bacteria TMDL	1
INB1145_T1002	Recreation Use (bacteria)	Bacteria TMDL	1
Wastewaters Creek - Otter Creek Subwatershed (05120111-04-06)			
INB1146_01	Recreation Use (bacteria)	Bacteria TMDL	1
INB1146_T1001	Recreation Use (bacteria)	Bacteria TMDL	1
INB1146_02	Recreation Use (bacteria)	Bacteria TMDL	1
INB1146_03	Recreation Use (bacteria)	Bacteria TMDL	1
		Total:	**23**

Water quality within the OCW has been monitored via efforts from the Indiana Department of Environmental Management (IDEM). Water quality sampling efforts involved measuring the health of the stream environments by collected field data in order to monitor the quality of aquatic biological communities, sediment, and the chemical, physical and habitat characteristics within each stream environment. IDEM determined that twenty-three segments within the OCW exceeded bacteria water quality standards.

Land Use:

The Otter Creek watershed encompasses approximately 79,360 acres within west-central Indiana. Land use in the OCW is comprised of forested lands, cultivated crop lands (agricultural), developed lands, pasture lands, grasslands & herbaceous lands, and wetlands. Land use coverage from the Multi-Resolution Land Characteristics Consortium (MRLCC, 2006) was utilized to calculate percentages of land cover within the OCW. Forested lands (42.01%) and cultivated crop lands (41.65%) account for two of the largest land cover categories in the OCW. The distribution of land uses are found in Table 2 of this Decision Document.

Table 2: Land use in the Otter Creek (IN) Watershed

Land Use Category Description	Acreage	Square Miles	Distribution (% of the total area in the Otter Creek Watershed)
Forested Land	33,359.23	52.12	42.01
Agriculture	33,072.12	51.68	41.65
Developed, Open Space	5,373.06	8.39	6.77
Pasture/Hay	4,441.67	6.94	5.59
Shrub/Scrub	1,112.19	1.73	1.4
Developed, Low Intensity	1,085.29	1.69	1.37
Wetlands	342.04	0.53	0.43
Open Water	321.58	0.5	0.4
Developed, Medium Intensity	208.61	0.33	0.26
Developed, High Intensity	96.96	0.15	0.12
TOTAL	79,412.75	124.06	100.00

Problem Identification:

IDEM identified the water body segments of Otter Creek and its tributaries on the 303(d) list of impaired waters. Bacteria exceedances can negatively impact recreational uses (fishing, swimming, wading, boating etc.) and public health. At elevated levels, bacteria may cause illness within humans who have contact with or ingest bacteria laden water. Recreation-based contact can lead to ear, nose, and throat infections, and stomach illness. *E. coli* is used as an indicator of the presence of bacteria.

Priority Ranking:
The OCW TMDL was prioritized to be completed at this time based on the IDEM rotating basin approach. In this approach available assessment resources are concentrated or targeted in defined watersheds for a specified period of time, thus allowing for water quality data to be collected and assessed in a spatially and temporally 'focused' manner. Over time, every portion of the state is targeted for monitoring and assessment.

IDEM utilizes a rotating basin approach to monitor water quality unless there is a significant reason to deviate from the rotating basin schedule. Deviations can lead to water bodies being upgraded or downgraded in priority depending on: the specified designated use and whether water quality standards are being met, the magnitude of the impairment, deviations to allow an appropriate amount of time for implementation practices to take hold, and instances where there is no water quality guidance available or guidance is currently being developed.

Pollutants of Concern:
<u>*Recreational Use:*</u> The pollutant of concern for full body contact recreational use impairment is *E. coli* which is an indicator for pathogenic bacteria.

Source Identification (point and nonpoint sources):
Point Source Identification: The potential point sources to the OCW are:

National Pollutant Discharge Elimination System (NPDES) permit holders: NPDES permitted facilities may contribute pollutant loads (bacteria) to surface waters through facility discharges of treated wastewater. Permitted facilities discharge treated wastewater according to their NPDES permit. IDEM identified two NPDES permit holders in the OCW which were assigned a portion of the wasteload allocation (WLA) (Table 3 in this Decision Document).

Table 3: Permitted NPDES dischargers in the Otter Creek watershed

NPDES ID	Facility Name	Subwatershed	Receiving Water	Design Flow (mgd)[1]	*Permit Limit for E. coli* [2]
IN0039829	Carbon WWTP	05120111-04-02	Ebenezer Creek	0.0252	125
IN0025224	Stauton WWTP	05120111-04-04	Sulphur Creek	0.1	125

1 = Maximum design flow
2 = Monthly Geometric Mean (cfu/100 mL)

Municipal Separate Storm Sewer Systems (MS4): There are two MS4 communities within the boundaries of the OCW (Table 4 of this Decision Document). Stormwater from MS4s can transport bacteria to surface water bodies during or shortly after storm events. Each of the MS4 communities within Table 4 of this Decision Document was assigned a portion of the WLA based on the jurisdictional area of the MS4 community or the percentage of developed land relative to the area of the entire AUID.

Table 4: Permitted MS4 communities in the Otter Creek watershed

NPDES ID	Facility Name	Area (square mile)	Subwatershed
INR040092	Seelyville MS4	0.53	05120111-04-04
INR040092	Terre Haute MS4	0.61	05120111-04-05
INR040092	Terre Haute MS4	3.54	05120111-04-06

Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs): There are no CSOs and no SSOs in the OCW.

Concentrated Animal Feeding Operations (CAFOs): There are no CAFO facilities in the OCW.

Nonpoint Source Identification: The potential nonpoint sources to the OCW are:

Stormwater runoff from agricultural land use practices: Runoff from agricultural lands may contain significant amounts of bacteria which may lead to impairments in the OCW. Manure spread onto fields is often a source of pollutants, and can be exacerbated by tile drainage lines, which channelize the stormwater flows and reduce the time available for bacteria to die-off. Tile lined fields and channelized ditches enable bacteria and other pollutants to move more efficiently into surface waters.

Confined feeding operations (CFOs): CFOs do not meet the definition of a CAFO and are considered by IDEM as a nonpoint source. CFOs have state-issued permits but are not under the jurisdiction of the federal NPDES Program. CFO permits are "no discharge" permits. Therefore it is prohibited for these facilities to discharge to any water of the State. IDEM identified two CFOs within the OCW (Table 5 of this Decision Document).

CFOs are agricultural operations where animals are kept and raised in confined spaces. CFOs generate manure which may be spread onto fields. Runoff from fields with spread manure from CFOs can be exacerbated by tile drainage lines, which channelize the stormwater flows and reduce the time available for bacteria to die-off. Tile-lined fields and channelized ditches enable pollutants to move into surface waters.

Table 5: Confined Feeding Operations in the Otter Creek watershed

Farm ID	Facility Name	AUID	Subwatershed	Receiving Water	Animals
600	Woll Farms Inc.	INB1144_T1001	05120111-04-04	Sulphur Creek	1,400 finishers
3346	Lyons Farm	INB1146_T1001	05120111-04-06	Wastewaters Creek - Otter Creek	417 Sows, 800 Nursery Pigs, 1,829 Finishers

Septic systems: Septic systems generally do not discharge directly into a water body, but their effluents may leach into groundwater or pond at the surface where they can be washed into surface waters via stormwater runoff events. Failing septic systems are a potential source of bacteria within the OCW. All the counties in the watershed follow the state rules IAC 6-8.3-52 (general sewage disposal requirements) and IAC 6-8.3-55 (violations; permit denial and revocation) regarding septic systems. Failures are typically identified through public complaints and the sale of older properties which have not passed inspection.

Unrestricted livestock access to streams: Livestock with access to stream environments may add bacteria directly to the surface waters or resuspend particles that had settled on the stream bottom. Direct deposition of animal wastes can result in very high localized bacteria counts and may contribute to downstream impairments. Smaller animal facilities may add bacteria to surface waters via wastewater from these facilities or stormwater runoff from near-stream pastures.

Urban runoff: Runoff from urban areas (urban, residential, commercial or industrial land uses) can contribute various pollutants, including bacteria to local water bodies. Stormwater from urban areas, which drain impervious surfaces, may introduce pollutants to surface waters. Potential urban sources of bacteria can also include wildlife or pet wastes. Uncollected pet waste is a source of *E. coli* to downstream water bodies. IDEM estimated pet numbers within the OCW to be approximately 6,050 dogs and 7,828 cats.

Wildlife: Deer, geese, ducks, raccoons, turkeys, and other animals are recognized as potential contributors of bacteria to the OCW.

Future Growth:
Significant development is not expected in the OCW. IDEM anticipates that the primary categories of land use within the OCW, forested lands and agricultural lands, will remain unchanged in the OCW. Population estimates for Clay, Parke and Vigo Counties have remained relatively stable since the 1990s and IDEM does not anticipate a significant increase on population within these counties. The WLA and the load allocation (LA) were calculated for all current and future sources. Any expansion of point or nonpoint sources will need to comply with the respective WLA and LA values in the TMDL. No portion of the loading capacity for the bacteria TMDLs, was assigned to a future growth/reserve capacity value.

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the first criterion.

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Targets

The TMDL submittal must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the water body, the applicable numeric or narrative water quality criterion, and the antidegradation policy (40 C.F.R. §130.7(c)(1)). EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

The TMDL submittal must identify a numeric water quality target(s) – a quantitative value used to measure whether or not the applicable water quality standard is attained. Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. Occasionally, the pollutant of concern is different from the pollutant that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as Dissolved Oxygen (DO) criteria). In such cases, the TMDL submittal should explain the linkage between the pollutant of concern and the chosen numeric water quality target.

Comment:

Designated Uses:

The designated uses for water bodies identified in the OCW TMDL are for full body contact recreation use.

Recreational use: The full body contact recreational use *E. coli* WQS for waters in the State of Indiana are as follows: (from Indiana Administrative Code 327 IAC 2-1.5-8(e)(3))

(3) For full body contact recreational uses, *E. coli* bacteria shall not exceed the following:
(A) One hundred twenty-five (125) per 100 milliliters as a geometric mean based on not less than five samples equally spaced over a 30 day period.
(B) Two hundred thirty-five (235) per 100 milliliters in any 1 sample in a 30 day period, except that in cases where there are at least 10 samples at a given site, up to 10 percent of the samples may exceed 235 cfu (colony forming units) or MPN (most probable number) per 100 milliliters where:

> (i) the *E. coli* exceedances are incidental and attributable solely to *E. coli* resulting from the discharge of treated wastewater from a wastewater treatment plant as defined at IC 13-11-2-258; and
> (ii) the criterion in clause (A) is met. However, a single sample shall be used for making beach notification and closure decisions.

The OCW TMDL *E. coli* target is: from April 1 through October 31, *E. coli* shall not exceed **125 cfu per 100 mL** (125 cfu/100 mL), as a geometric mean based on not less than five samples equally spaced over a 30-day period. Water bodies are held to recreation use criteria during the time of the year when people are most likely to be engaged in activities such as swimming, wading or boating. The recreation use criteria were established to protect against disease carrying organisms that may be ingested or introduced to the eyes, skin or other body parts during water recreation activities.

Table 6: Water quality standards and targets utilized within the Otter Creek watershed TMDL

Parameter	Units	Water Quality Criteria	TMDL development targets
Numeric Water Quality Standards for addressing the Bacteria impaired segments within the Otter Creek watershed			
E. Coli [1]	#/100 mL	Numeric	235 single sample maximum
		Numeric	Geometric mean < 125 [2]

1 = *E. coli* standards are for the recreation season only (April 1 through October 31).
2 = Geometric mean based on minimum of 5 evenly spaced samples taken over not more than a 30-day period.

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the second criterion.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a water body for the applicable pollutant. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

The pollutant loadings may be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is expressed in terms other than a daily load, e.g., an annual load, the submittal should explain why it is appropriate to express the TMDL in the unit of measurement chosen. The TMDL submittal should describe the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

The TMDL submittal should contain documentation supporting the TMDL analysis, including the basis for any assumptions; a discussion of strengths and weaknesses in the analytical process; and results from any water quality modeling. EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

TMDLs must take into account *critical conditions* for steam flow, loading, and water quality parameters as part of the analysis of loading capacity (40 C.F.R. §130.7(c)(1)). TMDLs should define applicable *critical conditions* and describe their approach to estimating both point and nonpoint source loadings under such *critical conditions*. In particular, the TMDL should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

Comment:

IDEM determined the loading capacities for the impaired water bodies in the OCW based on the water quality standards and water quality target values. The Load Duration Curve (LDC) approach was selected by IDEM to calculate TMDLs for bacteria. The LDC approach assigns loadings based on flow.

For all *E. coli* TMDLs addressed by the OCW TMDL, a geometric mean of **125 cfu/100 ml** for five samples equally spaced over a 30-day period, was utilized to set the loading capacity of the TMDL. IDEM believes the geometric mean portion of the WQS provides the best overall characterization of the status of the watershed. The EPA agrees with this assertion, as stated in the preamble of, *"The Water Quality Standards for Coastal and Great Lakes Recreation Waters Final Rule"* (69 FR 67218-67243, November 16, 2004) on page 67224, "…the geometric mean is the more relevant value for ensuring that appropriate actions are taken to protect and improve water quality because it is a more reliable measure, being less subject to random variation, and more directly linked to the underlying studies on which the 1986 bacteria criteria were based."

IDEM believes that by setting the bacteria TMDLs to the geometric mean (125 cfu/100 ML) portion of the full body contact recreational use WQS the impaired water body will attain its designated fully body contact recreational use (Section 2 of this Decision Document). EPA finds this assumption to be reasonable since the allocations of the bacteria TMDLs addressed in the OCW TMDLs are calculated to meet the WQS of 125 cfu/100 ml on any given day across all flow conditions within the OCW. Thus, when the TMDL is implemented and achieved, *E. coli* concentrations in the impaired segments should not exceed 125 cfu/100 ml. Therefore, implicitly the *E. coli* concentrations in the impaired segments should not exceed the single sample maximum WQS of 235 cfu/100 ml.

Typically loading capacities are expressed as a mass per time (e.g. pounds per day). However, for *E. coli* loading capacity calculations, mass is not always an appropriate measure because *E. coli* is expressed in terms of organism counts. This approach is consistent with the EPA's regulations which define "load" as "an amount of matter that is introduced into a receiving water" (40 CFR §130.2). To establish the loading capacities for the OCW TMDLs, IDEM used the water quality standard for *E. coli* (125 cfu/100 mL). A loading capacity is, "the greatest amount of loading that a water can receive without violating water quality standards." (40 CFR §130.2). Therefore, a loading capacity set at the WQS will assure that the water does not violate WQS. IDEM's *E. coli* TMDL approach is based upon the premise that all discharges (point and nonpoint) must meet the WQS when entering the water body. If all sources meet the WQS at discharge, then the water body should meet the WQS and its designated use.

IDEM approached the OCW TMDLs by calculating loading capacity values for individual impaired segments within the six HUC-12 watersheds (05120111-04-01, 05120111-04-02, 05120111-04-03, 05120111-04-04, 05120111-04-05 and 05120111-04-06). For example, impaired reaches (ex. INB1141_01 or INB1142_T1001) were assigned to their respective HUC-12 watershed based on the location of each impaired reach within the OCW. All reaches designated as impaired due to bacteria by IDEM were assigned an individual TMDL for bacteria (Table 7 of this Decision Document).

Flow duration curves (FDC) were created for each of the subwatersheds within the OCW. The FDC were developed from flow frequency tables based on recorded and scaled flow volumes measured at a USGS gage on Big Raccoon Creek near the town of Fincastle, Indiana (USGS gage ID #03340800). The OCW does not have a stream gage within the watershed, necessitating IDEM to use the USGS gage #03340880 from the Big Raccoon Creek watershed. The Big Raccoon Creek watershed is adjacent to the OCW. The flow data focused on dates within the recreation season (April 1 to October 31). Dates outside of the recreation season were excluded from the flow record. Flows at USGS gage #03340880 were employed to characterize the flows within the six HUC-12 subwatersheds in the OCW. Daily stream flows were necessary to implement the load duration curve approach. These were estimated using the observed flows available at the USGS gage on the Big Raccoon Creek and drainage area weighting using the following equation:

$$Q_{ungaged} = (A_{ungaged} / A_{gaged}) * Q_{gaged}$$

where,

$Q_{ungaged}$	= Flow at the ungaged location
Q_{gaged}	= Flow at surrogate USGS gage station, in the case of the OCW (#03340800)
$A_{ungaged}$	= Drainage area of the ungaged location
A_{gaged}	= Drainage area of the gaged location, in the case of the OCW (#03340800)

In this procedure, the drainage area of each monitoring station (or impaired segment) was divided by the drainage area of USGS gage #03340800. The flows for each of the stations were then calculated by multiplying the USGS gage #03340800 flows by the drainage area ratios. Additional flows were added to certain locations to account for wastewater treatment plants (WWTP) that discharge upstream and are not directly accounted for using the drainage area weighting method.

FDC graphs have flow duration interval (percentage of time flow exceeded) on the X-axis and discharge (flow per unit time) on the Y-axis. The FDC were transformed into LDC by multiplying individual flow values by the WQS (125 cfu/100 mL) and then by a conversion factor. The resulting points are plotted onto a load duration curve graph. LDC graphs, for the OCW bacteria TMDLs, have flow duration interval (percentage of time flow exceeded) on the X-axis and *E. coli* concentrations (number of bacteria per unit time) on the Y-axis. The OCW LDC used *E. coli* measurements in billions of bacteria per day. The curved line on a LDC graph represents the TMDL of the respective flow location and the flow conditions observed at that location.

IDEM completed water quality monitoring in the OCW basin in 2009 and measured *E. coli* concentrations at specific sampling points within the watershed. *E. coli* values from these efforts were converted to individual sampling loads by multiplying the sample concentration by the instantaneous flow measurement observed/estimated at the time of sample collection. The individual sampling loads were plotted on the same figure with the created LDC.

The LDC plots were subdivided into five flow regimes; very high flows (exceeded 0–10% of the time), moist conditions (exceeded 10–40% of the time), "normal" range flows (exceeded 40–60% of the time), dry conditions (exceeded 60–90% of the time), and low flows (exceeded 90–100% of the time). LDC plots can be organized to display individual sampling loads and the calculated LDC. Watershed managers can interpret these plots (individual sampling points plotted with the LDC) to understand the relationship between flow conditions and water quality exceedances within the watershed. Individual sampling loads which plot above the LDC represent violations of the WQS and the allowable load under those flow conditions at those locations. The difference between individual sampling loads plotting above the LDC and the LDC, measured at the same flow is the amount of reduction necessary to meet WQS.

The strengths of using the LDC method are that critical conditions and seasonal variation are considered in the creation of the FDC by plotting hydrologic conditions over the flows measured during the recreation season. Additionally, the LDC methodology is relatively easy to use and cost-effective. The weaknesses of the LDC method are that nonpoint source allocations cannot be assigned to specific sources, and specific source reductions are not quantified. Overall, IDEM believes and EPA concurs that the strengths outweigh the weaknesses for the LDC method.

Implementing the results shown by the LDC requires watershed managers to understand the sources contributing to the water quality impairment and which Best Management Practices (BMPs) may be the most effective for reducing bacteria loads based on flow magnitudes. Different sources will contribute bacteria loads under varying flow conditions. For example, if exceedances are significant during high flow events this would suggest storm events are the cause and implementation efforts can target BMPs that will reduce stormwater runoff and consequently bacteria loading into surface waters. This allows for a more efficient implementation effort.

TMDLs were calculated for each HUC-12 subwatershed in the OCW. WLA were assigned to NPDES permitted facilities and MS4 communities where appropriate in each individual subwatershed. Load allocations were calculated after the determination of the WLA, and the Margin of Safety (10% of the loading capacity). Load allocations were not split amongst individual nonpoint contributors (ex. stormwater runoff from agricultural land use practices, failing septic systems, non-regulated urban stormwater runoff etc.). Instead, load allocations were represented as one value for each TMDL.

Table 7 of this Decision Document reports five points (the midpoints of the designated flow regime) on the loading capacity curve. However, it should be understood that the components of the TMDL equation could be illustrated for any point on the entire loading capacity curve. The load duration curve method can be used to display collected bacteria monitoring data and allows for the estimation of load reductions necessary for attainment of the bacteria water quality standard. Using this method, daily loads were developed based upon the flow in the water body. Loading capacities were determined for the segment for multiple flow regimes. This allows the TMDL to be represented by an allowable daily load across all flow conditions. Table 7 of this Decision Document identifies the loading capacity for the water body at each flow regime. Although there are numeric loads for each flow regime, the LDC is what is being approved for this TMDL.

Table 7: Bacteria (*E. coli*) TMDLs for the Otter Creek Watershed

Flow Regime TMDL analysis *E. coli* (billions of bacteria/day)	**High**	**Moist Conditions**	**Normal Flows**	**Dry Conditions**	**Low Flows**
Duration Interval	0 - 10 %	10 - 40 %	40 - 60 %	60 - 90 %	90 - 100 %
Headwaters Otter Creek Subwatershed (05120111-04-01)					
1 Segment: INB1141_01					
Bacteria TMDL (billions of bacteria/day)	**366.30**	**97.50**	**39.60**	**9.70**	**2.697**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	329.70	87.75	35.64	8.73	2.67
Margin Of Safety (MOS) (10%)	36.60	9.75	3.96	0.97	0.027
North Branch Otter Creek Subwatershed (05120111-04-02)					
8 Segments: INB1142_01, INB1142_01A, INB1142_01B, INB1142_01C, INB1142_T1001, INB1142_T1003, INB1142_T1004 & INB1142_T1005					
Bacteria TMDL (billions of bacteria/day)	**560.17**	**149.05**	**60.61**	**14.90**	**2.88**
Wasteload Allocation (WLA): Total	0.09	0.09	0.09	0.09	0.09
Carbon WWTP (IN0039829)	0.09	0.09	0.09	0.09	0.09
Load Allocation (LA)	504.06	134.06	54.46	13.32	2.50
Margin Of Safety (MOS) (10%)	56.02	14.90	6.06	1.49	0.29
Little Creek - North Branch Otter Creek Subwatershed (05120111-04-03)					
4 Segments: INB1143_01, INB1143_T1001, INB1143_T1001A & INB1143_T1002					
Bacteria TMDL (billions of bacteria/day)	**914.10**	**243.20**	**98.90**	**24.30**	**6.80**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	822.70	218.90	89.00	21.90	6.10
Margin Of Safety (MOS) (10%)	91.40	24.30	9.90	2.40	0.70
Sulphur Creek Subwatershed (05120111-04-04)					
3 Segments: INB1144_01, INB1144_T1001, & INB1144_T1001A					
Bacteria TMDL (billions of bacteria/day)	**571.200**	**151.910**	**61.710**	**15.100**	**2.830**
Wasteload Allocation (WLA): Total	12.20	0.37	0.37	0.37	0.37
Staunton WWTP (IN0025224)	0.37	0.37	0.37	0.37	0.37
Seelyville MS4 (INR040092)	11.83	0.00	0.00	0.00	0.00

Load Allocation (LA)	501.87	136.34	55.16	13.21	2.17
Margin Of Safety (MOS) (10%)	57.13	15.20	6.18	1.52	0.29
Gundy Creek Subwatershed (05120111-04-05)					
3 Segments: INB1145_01, INB1145_T1001, & INB1145_T1002					
Bacteria TMDL (billions of bacteria/day)	**427.80**	**113.80**	**46.30**	**11.40**	**3.20**
Wasteload Allocation (WLA): Total	12.80	0.00	0.00	0.00	0.00
Terre Haute MS4 (INR040092)	12.80	0.00	0.00	0.00	0.00
Load Allocation (LA)	372.20	102.40	41.70	10.30	2.90
Margin Of Safety (MOS) (10%)	42.80	11.40	4.60	1.10	0.30
Wastewaters Creek - Otter Creek Subwatershed (05120111-04-06)					
4 Segments: INB1146_01, INB1146_T1001, INB1146_02 & INB1146_03					
Bacteria TMDL (billions of bacteria/day)	**2893.60**	**752.00**	**305.80**	**75.10**	**21.10**
Wasteload Allocation (WLA): Total	103.30	0.00	0.00	0.00	0.00
Terre Haute MS4 (INR040092)	103.30	0.00	0.00	0.00	0.00
Load Allocation (LA)	2500.90	676.80	275.20	67.60	19.00
Margin Of Safety (MOS) (10%)	289.40	75.20	30.60	7.50	2.10

Table 8 of the Decision Document discusses IDEM's estimates of loading reductions for selected segments in the OCW. These loading reductions (i.e., the percent reduction column) were calculated from field sampling data collected in the OCW by IDEM in April – May 2009 (Appendix C of the final TMDL document). Flow conditions in these selected water bodies in April – May 2009 were illustrative of the 'moist condition' flow regime of the flow duration curve. IDEM has communicated the loading reductions in Table 8 of this Decision Document are conservative load reduction estimates based on a limited water quality data set. IDEM would need to collect a more robust water quality data set over a variety of flow conditions for IDEM to characterize, with greater confidence, expected load reductions in the OCW when the TMDLs are achieved.

Table 8: Bacteria (*E. coli*) Load Reductions for the Otter Creek Watershed

Subwatershed	Station #	AUID	Total Number of Samples	Percent of Samples Exceeding *E. coli* WQS (# / 100 mL)		Geomean (# / 100 mL)	Percent Reduction Based on Geomean (125/100mL)
				125	***235***		
Headwaters Otter Creek	WBU030-0084	INB1141_01	5	80	40	283.64	55.93
	WBU030-0079		5	100	60	339.67	63.2
North Branch Otter Creek	WBU030-0081	INB1142_01	5	60	20	246.59	49.31
	WBU030-0082	INB1142_01	5	40	20	217.88	42.63
	WBU030-0050	INB1142_01	5	20	20	96.47	0
	WBU030-0052	INB1142_T1001	5	40	20	149.31	16.28
Little Creek- North Branch Otter Creek	WBU030-0076	INB1143_01	5	100	20	262.56	52.39

Sulphur Creek	WBU030-0016	INB1144_01	5	100	60	381.35	67.22
	WBU030-0012	INB1144_01	5	80	40	314.56	60.26
	WBU030-0014	INB1144_T1002	5	20	20	75.45	0
Gundy Ditch	WBU030-0074	INB1145_01	5	40	40	197.18	36.61
	WBU030-0011	INB1145_01	5	100	20	378.29	66.96
	WBU030-0075	INB1145_T1001	5	40	20	154.98	19.34
	WBU030-0073	INB1145_T1002	5	100	40	804.86	84.47
Wastewaters Creek Otter Creek	WBU030-0078	INB1146_01	5	100	20	304.52	58.95
	WBU030-0077	INB1146_01	5	100	20	293.35	57.39
	WBU030-0080	INB1146_T1001	5	80	20	276.68	54.82
	WBU030-0001	INB1146_02	5	100	20	291.09	57.06
	WBU030-0072	INB1146_03	5	100	20	261.68	52.23

EPA concurs with the data analysis and LDC approach utilized by IDEM in their calculation of wasteload allocations, load allocations and the margin of safety for the Otter Creek watershed TMDLs. The methods used for determining the TMDL are consistent with U.S. EPA technical memos.[1]

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the third criterion.

4. Load Allocations (LA)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity attributed to existing and future nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)). Where possible, load allocations should be described separately for natural background and nonpoint sources.

Comment:

LAs for nonpoint sources were calculated in the TMDL development process, along with the calculations for the load assigned to the WLA and the margin of safety. IDEM determined the load allocation calculations for each of the subwatershed TMDLs based on the *E. coli* WQS

[1] U.S. Environmental Protection Agency. August 2007. *An Approach for Using Load Duration Curves in the Development of TMDLs*. Office of Water. EPA-841-B-07-006. Washington, D.C.

(125 cfu/100 mL). The WQS were applicable across all flow conditions in the subwatershed (Table 7 of this Decision Document).

IDEM identified several nonpoint sources in this TMDL report. Load allocations were recognized as originating from many diverse nonpoint sources including urban stormwater runoff, failing septic systems, stormwater runoff from agricultural land use practices, livestock with access to stream areas, stream channelization and stream erosion, and wildlife (deer, geese, ducks, raccoons, turkeys and other animals). IDEM did not determine individual load allocation values for each of these potential nonpoint source considerations, but aggregated the nonpoint sources into one LA value.

The implementation strategies outlined by IDEM in the OCW TMDL will aid local partners in determining appropriate mitigation strategies for these nonpoint source inputs. Additional sources of information which may be called upon by IDEM to aid in setting mitigation strategies, are field observations made during the collection of water quality monitoring data in 2009. These observations (ex. land use, housing density, location of livestock facilities and proximity to sampling locations) may assist watershed managers in identifying potential nonpoint sources of bacteria. EPA finds the IDEM's approach for calculating the LA to be reasonable.

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the fourth criterion.

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to individual existing and future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit.

The individual WLAs may take the form of uniform percentage reductions or individual mass based limitations for dischargers where it can be shown that this solution meets WQSs and does not result in localized impairments. These individual WLAs may be adjusted during the NPDES permitting process. If the WLAs are adjusted, the individual effluent limits for each permit issued to a discharger on the impaired water must be consistent with the assumptions and requirements of the adjusted WLAs in the TMDL. If the WLAs are not adjusted, effluent limits contained in the permit must be consistent with the individual WLAs specified in the TMDL. If a draft permit provides for a higher load for a discharger than the corresponding individual WLA in the TMDL, the State/Tribe must demonstrate that the total WLA in the TMDL will be achieved through reductions in the remaining individual WLAs and that localized impairments will not result. All permittees should be notified of any deviations from the initial individual WLAs contained in the TMDL. EPA does not require the establishment of a new TMDL to reflect these revised allocations as long as the total WLA, as expressed in the TMDL, remains the same or decreases, and there is no reallocation between the total WLA and the total LA.

Comment:
IDEM identified two NPDES permit holders (Table 3 of this Decision Document) within the OCW which received a portion of the WLA assigned to mitigate bacteria inputs. Individual WLAs were

developed as part of the TMDL development process for those permittees discharging directly to impaired reaches. WLAs for individual facilities were calculated based on each facility's design flow and the permit limit (ex. *E. coli* permit limits are set at the WQS of 125 cfu/100 mL). IDEM expects each NPDES permitted facility to meet the concentration targets assigned in the WLA across all flow conditions.

MS4s within the OCW (Table 4 of this Decision Document) were assigned a portion of the WLA based on the bacteria WQS (125 cfu / 100 mL) and the area of the particular MS4 community which is within the boundaries of the subwatershed in question (Table 7 of this Decision Document). For example, in the Sulphur Creek subwatershed (05120111-04-04) there is one MS4 community, the Seelyville MS4 community (INR040092) which occupies 0.53 square miles of the land area within the boundary of the Sulphur Creek subwatershed. The Seelyville MS4 was assigned a portion of the WLA based on the percentage of land area within the boundary of the 05120111-04-04 subwatershed. This practice of assigning MS4 WLAs was duplicated in other subwatersheds within the OCW TMDL.

There are no CSO communities and no SSOs within the OCW (WLA = 0 cfu per 100 mL). There are no CAFOs in the watershed boundaries of the OCW. Therefore, WLA attributed to contributions from CAFOs was set to zero (WLA = 0).

EPA finds the IDEM's approach for calculating the WLA to be reasonable.

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the fifth criterion.

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety (MOS) 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's 1991 TMDL 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.

Comment:

IDEM incorporated an explicit Margin of Safety (MOS) into the development of the bacteria TMDLs. The explicit MOS was applied by reserving approximately 10% of the total loading capacity, and then allocating the remaining loads to point (WLA) and nonpoint sources (Table 7 of this Decision Document). The use of the LDC approach minimized variability associated with the development of the OCW TMDLs because the calculation of the loading capacity was a function of flow multiplied by the target value. The MOS was set at 10% to account for uncertainty due to field sampling error and assumptions made during the TMDL development process which were based on water quality monitoring with low sample sizes.

The MOS for the OCW TMDLs also incorporated certain conservative assumptions in the calculation of the TMDLs. No rate of decay, or die-off rate of pathogen species, was used in the OCW TMDL calculations or in the creation of load duration curves for *E. coli*. Bacteria have a limited capability of surviving outside their hosts, and normally a rate of decay would be incorporated. IDEM determined that it was more conservative to use the WQS (125 cfu/100 mL) and not to apply a rate of decay, which could result in a discharge limit greater than the WQS.

As stated in *EPA's Protocol for Developing Pathogen TMDLs* (EPA 841-R-00-002), many different factors affect the survival of pathogens, including the physical condition of the water. These factors include, but are not limited to sunlight, temperature, salinity, and nutrient deficiencies. These factors vary depending on the environmental condition/circumstances of the water, and therefore it would be difficult to assert that the rate of decay caused by any given combination of these environmental variables was sufficient enough to meet the WQS of 125 cfu/100 mL and 235 cfu/100ml.

The U.S. EPA finds that the TMDL document submitted by IDEM contains an appropriate MOS satisfying the requirements of the sixth criterion.

7. Seasonal Variation

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

Comment:

The bacteria (*E. coli*) TMDLs incorporated seasonal variation into the development of the OCW TMDLs. Bacterial loads vary by season, typically reaching higher numbers in the dry summer months when low flows and bacterial growth rates contribute to their abundance, and reaching relatively lower values in colder months when bacterial growth rates attenuate and loading reduces as agricultural activity slows. Bacterial WQS need to be met during the recreational season (April 1^{st} to October 31^{st}), regardless of the flow condition. The development of the LDCs utilized flow measurements from a local USGS gage. These flow measurements were collected over a variety of flow conditions observed during the recreation season. LDCs developed from these flow records represented a range of flow conditions within the OCW and thereby accounted for seasonal variability over the recreation season. TMDL loads were based on sampling that occurred during the recreational season in 2009. Seasonal variability was accounted for by taking multiple samples per month during the recreational season.

Critical conditions for *E. coli* loading occur in the dry summer months. This is typically when stream flows are lowest, and bacterial growth rates can be high. The State of Indiana does not have an applicable full body contact *E. coli* water quality standard for the remainder of the calendar year (November 1 through March 31). By meeting the WQS during the summer recreation season, it can reasonably be assumed that the loading capacity values would be protective of water quality during the remainder of the calendar year (November through March).

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the seventh criterion.

8. Reasonable Assurances

When a TMDL is developed for waters impaired by point sources only, the issuance of a NPDES permit(s) provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R. 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an approved TMDL.

When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by nonpoint sources. However, EPA cannot disapprove a TMDL for nonpoint source-only impaired waters, which do not have a demonstration of reasonable assurance that LAs will be achieved, because such a showing is not required by current regulations.

Comment:
The OCW TMDL was the first TMDL submittal by IDEM which employed Indiana's new TMDL template. The intent of the new Indiana TMDL template is to incorporate the required elements of an approvable TMDL with EPA's *Nine Elements of a Watershed Management Plan* (i.e., the Nine Elements). The Nine Elements provide the basis for Section 319 project implementation funding. The addition of the Nine Elements related discussion is meant to provide state and local partners with necessary information for those partners to more efficiently apply for federal and state funding programs (ex. federal 319 grant funding). EPA anticipates that the inclusion of the Nine Elements information will aid local managers in their efforts to apply for nonpoint source funding and ultimately to address nonpoint source load reductions.

The OCW TMDL provides a discussion of reasonable assurance in Section 9 of the final TMDL document. The OCW TMDLs provide reasonable assurances that actions identified in the implementation strategy, as discussed in the TMDL document in Section 9, will be applied to attain the loading capacities and allocations calculated for the impaired reaches within the OCW. The recommendations made by IDEM will be successful at improving water quality if the appropriate local groups work to implement these recommendations. Those mitigation suggestions, which fall outside of regulatory authority, will require commitment from state agencies and local stakeholders to carry out the suggested actions. IDEM has identified several local partners which have expressed interest in working to improve water quality within the OCW. These partners are the: Indiana State University, the Nature Conservancy, Indiana State Department of Agriculture (ISDA), Clay, Parke and Vigo County Health Departments, the Vigo County Conservation Club, the West Central Indiana Economic Development District, the Wabash Valley Audubon group and Soil and Water Conservation Districts (SWCDs) for Clay, Parke and Vigo Counties.

Continued water quality monitoring within the basin is supported by IDEM. Additional water quality monitoring results could provide insight into the success or failure of BMPs systems designed to reduce bacteria and nutrient effluent loading into the surface waters of the watershed. Local watershed managers would be able to reflect on the progress or lack of progress of the various pollutant removal strategies and would have the opportunity to change course if observed progress is unsatisfactory.

Reasonable assurance that the WLA set forth in the OCW TMDL will be implemented is provided by regulatory actions. According to 40 CFR 122.44(d)(1)(vii)(B), NPDES permit effluent limits must be consistent with assumptions and requirements of all WLAs in an approved TMDL. IDEM's stormwater program, the NPDES permit program, and SSO program are the implementing programs for ensuring WLA are consistent with the TMDL. Stormwater runoff associated with MS4 conveyances are regulated by 327 IAC 15-13-1 (Rule 13). There are two regulated MS4 communities in the Otter Creek Watershed: the Town of Seelyville (INR040092) and the Town of Terre Haute (INR040092). Implementation of each of these towns' MS4 permit will improve water quality in the OCW.

CFOs are permitted by the State of Indiana. Facilities are required to manage their manure, litter, and process wastewater so that they do not cause or contribute to a water quality impairment. Reasonable assurances that nonpoint source reductions will be achieved for *E. coli* are described in Section 9 of the final TMDL submittal. Reducing stormwater flows from croplands is a primary recommendation for reducing pollutant loads in the watershed. More specifically, cover cropping and residue management is recommended to reduce erosion and thus siltation and runoff into streams. Streamside buffering, particularly via wetland restoration or construction, is a recommended practice that may help in reducing bacteria pollutant loadings, and in some cases may help mitigate flow alteration by maximizing infiltration rates. Public education and outreach events may also be valuable in getting information out to stakeholders on stormwater pollution challenges and mitigation practices.

The OCW TMDL implementation efforts will be achieved through federal, state and local action. Federal funding, via the Section 319 grants program, can provide money to implement voluntary nonpoint source programs within the watershed. The Clay, Parke and Vigo County SWCDs have received funding from federal and state sources to support a variety of agricultural BMPs (ex. riparian corridor restoration and filter/buffer areas) within the OCW watershed. These BMPs were installed to aid in the reduction of bacteria and nutrient inputs to surface waters in the OCW watershed. Other state led efforts will be via NPDES permit enforcement, the IDEM Stormwater Program, the IDEM Nonpoint Source program, and various other land and water resource protection efforts sponsored by state agencies.

The U.S. EPA finds that this criterion has been adequately addressed.

9. Monitoring Plan to Track TMDL Effectiveness

EPA's 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur. Such a TMDL should provide assurances that nonpoint source controls will achieve expected load reductions and, such TMDL should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring and leading to attainment of water quality standards.

Comment:
IDEM completed a comprehensive biological, physical and chemical survey of streams within the OCW in 2009 as part of its basin monitoring schedule. Water quality data were collected at various locations within the OCW and those assessments were utilized to develop the TMDLs in this report. Future monitoring in the OCW will also occur on IDEM's nine-year rotating basin schedule or once TMDL implementation BMPs are incorporated in the watershed. The IDEM monitoring efforts are designed to assess water quality improvements with respect to bacteria (*E. coli*) concentrations. Monitoring will be adjusted as needed to assist in continued source identification and elimination and will also test the efficiency of pollution reduction strategies.

Continued water quality monitoring within the basin is supported by IDEM. Additional water quality monitoring results will provide understanding of the success or failure of BMPs systems designed to reduce bacteria loading into the surface waters of the watershed. Local watershed managers will be able to reflect on the progress or lack of progress of the various pollutant removal strategies and will have the opportunity to change course if observed progress is unsatisfactory. IDEM will monitor whether bacteria (*E. coli*) targets are being achieved and adjust the OCW BMPs strategy accordingly to meet these water quality targets. When results indicate that the water body is meeting the appropriate WQS and targets, the water body will be removed from Indiana's List of Impaired Waters.

The U.S. EPA finds that this criterion has been adequately addressed.

10. Implementation

EPA policy encourages Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired by nonpoint sources. Regions may assist States/Tribes in developing implementation plans that include reasonable assurances that nonpoint source LAs established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. In addition, EPA policy recognizes that other relevant watershed management processes may be used in the TMDL process. EPA is not required to and does not approve TMDL implementation plans.

Comment:
The focus of implementation strategies will be the reduction of bacterial inputs to the surface waters in the OCW. Local partners, such as the Clay, Parke and Vigo County SWCDs, will bear the responsibility for assisting in the management of public lands and waters within the OCW. These partners will also be tasked with finding creative adaptive management strategies to meet changing water quality conditions within the watershed. The focus of all implementation strategies will be to reduce bacterial inputs to the surface waters of the OCW. The main bacterial reduction strategies include:

Septic System Improvements: Local septic management programs and educational opportunities can aid in the reduction of septic pollution. Educating the public on proper septic maintenance, finding and eliminating illicit discharges and repairing failing systems could lessen the impacts of septic derived bacterial inputs to the OCW.

Reducing Livestock Access to Stream Environments: The installation of exclusion fencing near stream and river environments to prevent direct access for livestock, installing alternative water supplies, and installing stream crossings between pastures, would reduce the influxes of bacteria and improve water quality within the watershed.

Manure Collection and Storage Practices: Manure has been identified as a source of bacteria. Bacteria can be transported to surface water bodies via stormwater runoff. Bacteria laden water can also leach into groundwater resources. Improved strategies for the collection, storage and management of manure can minimize impacts of bacteria entering the surface and groundwater system. Repairing manure storage facilities or building roofs over manure storage areas may decrease the amount of bacteria in stormwater runoff.

Riparian Area Management Practices: Protection of streambanks within the watershed through planting of vegetated/buffer areas with grasses, legumes, shrubs or trees will mitigate bacteria inputs into surface waters. These areas will filter stormwater runoff before the runoff enters the main stem or tributaries of the OCW.

Agricultural Land Management Practices: Runoff from cropland and pastures combined with the application of manure to fields in the late summer are a likely source of bacteria found in stormwater runoff from agricultural areas. Planting vegetation along riparian areas (riparian buffers) will aid to slow down water and allow it to filter through the vegetation before entering surface water environments.

The U.S. EPA finds that this criterion has been adequately addressed. The U.S. EPA reviews but does not approve implementation plans.

11. Public Participation

EPA policy is that there should be full and meaningful public participation in the TMDL development process. The TMDL regulations require that each State/Tribe must subject calculations to establish TMDLs to public review consistent with its own continuing planning process (40 C.F.R. §130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval should describe the State's/Tribe's public participation process, including a summary of significant comments and the State's/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)).

Provision of inadequate public participation may be a basis for disapproving a TMDL. If 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.

Comment:
The public's participation in the TMDL development process is outlined within Section 10 of the final TMDL document. The IDEM has been in contact with local groups and municipal officials throughout the development of these TMDLs. A public kickoff meeting was held on January 11, 2011 in Terre Haute, Indiana at the Vigo County Annex. The public was invited to submit any additional water quality data and information toward the development of the Otter Creek watershed TMDL during the kickoff meeting in 2011. A draft TMDL meeting was held on June 4, 2013 in Terre Haute, Indiana at the Vigo County Annex. The public was invited to submit formal comments on the draft document and informed of the findings of the document. Press releases were sent for each meeting and the Otter Creek watershed group was notified by e-mail.

The draft TMDL report was available for public comment from June 4, 2013 to July 4, 2013. IDEM posted the draft report online at (http://www.in.gov/idem/nps/3871.htm). IDEM did not receive any public comments on the draft OCW TMDL during the public comment period. IDEM submitted the final TMDL and submittal letter to the U.S. EPA on August 22, 2013.

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of this eleventh element.

12. Submittal Letter

A submittal letter should be included with the TMDL submittal, and should specify whether the TMDL is being submitted for a *technical review* or *final review and approval*. 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 Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final review and approval, should contain such identifying information as the name and location of the water body, and the pollutant(s) of concern.

Comment:
The U.S. EPA received the final OCW TMDL document and submittal letter from the IDEM on August 22, 2013. The transmittal letter explicitly stated that enclosed was the final TMDL report detailing the OCW TMDLs which address recreational use impairments due to bacteria inputs. The OCW TMDLs include impaired reaches within the following HUC-12 subwatersheds within the OCW;

- Headwaters Otter Creek (050120111-04-01);
- North Branch Otter Creek (050120111-04-02);
- Little Creek – North Branch Otter Creek (050120111-04-03);
- Sulphur Creek (050120111-04-04);
- Gundy Ditch (050120111-04-05); and
- Wastewaters Creek - Otter Creek (050120111-04-06).

TMDLs within these subwatersheds were being submitted to U.S. EPA pursuant to Section 303(d) of the Clean Water Act for U.S. EPA review and approval. The letter clearly stated that this was a final TMDL submittal under Section 303(d) of CWA. The letter also contained the name of the watershed as it appears on Indiana's 303(d) list, and the causes/pollutants of concern. This TMDL was submitted per the requirements under Section 303(d) of the Clean Water Act and 40 CFR 130.

The U.S. EPA finds that the TMDL transmittal letter submitted for Otter Creek watershed by IDEM satisfies the requirements of this twelfth element.

13. Conclusion

After a full and complete review, the U.S. EPA finds that the TMDLs submitted for the OCW satisfy all of the elements of approvable TMDLs. This approval is for **twenty-three (23) bacteria TMDLs**, addressing water bodies in six HUC-12 subwatersheds (050120111-04-01, 050120111-04-02, 050120111-04-03, 050120111-04-04, 050120111-04-05 & 050120111-04-06) for recreational use impairments. Refer to Table 1 of this Decision Document for subwatershed and AUID details.

The U.S. EPA's approval of these TMDLs extend to the water bodies which are identified within the OCW, with the exception of any portions of the water bodies that are within Indian Country, as defined in 18 U.S.C. Section 1151. The U.S. EPA is taking no action to approve or disapprove TMDLs for those waters at this time. The U.S. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under the CWA Section 303(d) for those waters.

ATTACHMENT 1: Revisions to EPA's Decision Document for the Otter Creek Watershed TMDL

TOPIC: Revision to bacteria TMDL documentation for IDEM submitted bacteria TMDLs from 2013-2015

ISSUE:

In December 2017, Indiana Department of Environmental Management (IDEM) explained that it had found inaccuracies in some of its TMDL documentation dating back to TMDLs submitted in 2013. More specifically, IDEM identified that it had mischaracterized how it calculated bacteria TMDLs in IDEM TMDL reports. IDEM confirmed that these inaccuracies were solely in the main body of the TMDL report and that the actual bacteria TMDL calculations were correct. Therefore, IDEM did not need to revise/change any TMDL calculations or TMDL tables in these TMDL reports.

BACKGROUND:

After an internal review of its TMDL process in 2016, IDEM found that five bacteria TMDLs submitted between 2013-2015 (i.e., the Big Raccoon Creek TMDL (2013), the Otter Creek TMDL (2013), the Deep River-Portage Burns TMDL (2014), the Lower Big Blue River TMDL (2014) & the Whitewater River TMDL (2015)) included language within the main body of the TMDL documents which was inaccurate. This incorrect language involved IDEM's discussion of the bacteria water quality standard (WQS) and how the bacteria WQS were used to calculate bacteria TMDLs.

IDEM's bacteria WQS have a single sample maximum criteria (SSMC) of 235 counts per 100 mL and a geometric mean criteria (GMC) of 125 counts per 100 mL. IDEM calculates bacteria TMDLs (i.e., the loading capacity values for the load duration curve (LDC)) using the SSMC (235). In the main body of the final TMDL report for the five bacteria TMDLs of 2013-2015, IDEM described its process for estimating bacteria TMDLs as using the GMC (125) portion of the bacteria WQS. This explanation was incorrect, as IDEM actually used the SSMC (235) portion of the bacteria WQS and not the GMC (125) for its bacteria TMDL calculations. IDEM identified this error within its final TMDL reports and requested EPA's assistance to retroactively update its bacteria TMDL documentation for bacteria TMDLs submitted 2013-2015.

Upon identifying this issue, IDEM has updated its language used in bacteria TMDL reports to reflect the correct SSMC value. All TMDLs submitted after this issue was discovered include the correct discussion of bacteria WQS which factor into TMDL calculations.

NOTE:

- No TMDL calculations are being updated or changed via this action. EPA is solely updated language used in EPA Decision Documents regarding IDEM's approach to calculating bacteria TMDLs.
- Regardless of the portion of the bacteria WQS (i.e., SSMC vs. GMC) which IDEM has selected to calculate bacteria TMDLs, EPA notes that both the SSMC and the GMC

portions of the WQS apply to bacteria TMDLs as explained by IDEM in Section 2 of their final TMDL document.

++++++++++

Revisions to EPA's Decision Document:

Section 2 of the Decision Document – **Description of the Applicable Water Quality Standards and Numeric Water Quality Targets**

Original Decision Document language: The OCW TMDL *E. coli* target is: from April 1 through October 31, *E. coli* shall not exceed **125 cfu per 100 mL** (125 cfu/100 mL), as a geometric mean based on not less than five samples equally spaced over a 30-day period. Water bodies are held to recreation use criteria during the time of the year when people are most likely to be engaged in activities such as swimming, wading or boating. The recreation use criteria were established to protect against disease carrying organisms that may be ingested or introduced to the eyes, skin or other body parts during water recreation activities.

Revised Decision Document language: The OCW TMDL *E. coli* target is: from April 1 through October 31, *E. coli* shall not exceed **235 cfu per 100 mL** (235 cfu/100 mL). For *E. coli* TMDLs, allocations were calculated based upon the 235 cfu/100 mL portion of the criteria. EPA believes this is protective of both portions of the criteria. The EPA report, "*An Approach for Using Load Duration Curves in the Development of TMDLs*" (EPA, 2007) describes how the monthly geometric mean (in this case, 125 cfu/100 mL for *E. coli*) is likely to be met when the single sample maximum value (in this case, 235 cfu/100 mL for *E. coli*) is used to develop the loading capacity. The process calculates the daily maximum bacteria value that is possible to observe and still attain the monthly geometric mean. If the single sample maximum is set as a never-to-be surpassed value then it becomes the maximum value that can be observed, and all other bacteria values would have to be less than the maximum, i.e., 235 cfu/100 mL. EPA notes that whichever portion of the criteria is used to determine the allocations, both the monthly geometric mean and single sample maximum will be used to assess the extent of implementation by point and nonpoint sources.

Section 3 of the Decision Document – **Loading Capacity – Linking Water Quality and Pollutant Sources**

Original Decision Document language: ***Bacteria (E. coli) TMDLs:*** For all *E. coli* TMDLs addressed by the OCW TMDL, a geometric mean of **125 cfu/100 ml** for five samples equally spaced over a 30-day period, was utilized to set the loading capacity of the TMDL. IDEM believes the geometric mean portion of the WQS provides the best overall characterization of the status of the watershed. The EPA agrees with this assertion, as stated in the preamble of, *"The Water Quality Standards for Coastal and Great Lakes Recreation Waters Final Rule"* (69 FR 67218-67243, November 16, 2004) on page 67224, "…the geometric mean is the more relevant value for ensuring that appropriate actions are taken to protect and improve water quality because it is a more reliable measure, being less subject to random variation, and more directly linked to the underlying studies on which the 1986 bacteria criteria were based."

IDEM believes that by setting the bacteria TMDLs to the geometric mean (125 cfu/100 mL) portion of the full body contact recreational use WQS the impaired water body will attain its designated fully body contact recreational use (Section 2 of this Decision Document). EPA finds this assumption to be reasonable since the allocations of the bacteria TMDLs addressed in the BRCW TMDLs are calculated to meet the WQS of 125 cfu/100 ml on any given day across all flow conditions within the BRCW. Thus, when the TMDL is implemented and achieved, *E. coli* concentrations in the impaired segments should not exceed 125 cfu/100 ml. Therefore, implicitly the *E. coli* concentrations in the impaired segments should not exceed the single sample maximum WQS of 235 cfu/100 ml.

Revised Decision Document language: ***Bacteria (E. coli) TMDLs:*** For all *E. coli* TMDLs addressed by the OCW TMDL, the *E. coli* WQS of **235 cfu/100 mL**, was used to set the loading capacity of the TMDL. IDEM believes that the single sample maximum component of the *E. coli* WQS provides the best overall characterization of the status of the watershed. IDEM believes that by setting the bacteria TMDLs to meet the single sample maximum (235 cfu/100 mL) portion of the full body contact recreational use WQS the impaired waterbody will attain its designated full body contact recreational use (Section 2 of this Decision Document). EPA finds this assumption to be reasonable since the allocations of the bacteria TMDLs addressed in the OCW TMDLs are calculated to meet the WQS of 235 cfu/100 mL on any given day, across all flow conditions within the OCW.

Typically loading capacities are expressed as a mass per time (e.g. pounds per day). However, for *E. coli* loading capacity calculations, mass is not always an appropriate measure because *E. coli* is expressed in terms of organism counts. This approach is consistent with the EPA's regulations which define "load" as "an amount of matter that is introduced into a receiving water" (40 CFR §130.2). To establish the loading capacities for the OCW TMDLs, IDEM used the water quality standard for *E. coli* (235 cfu/100 mL). A loading capacity is, "the greatest amount of loading that a water can receive without violating water quality standards." (40 CFR §130.2). Therefore, a loading capacity set at the WQS will assure that the water does not violate WQS. IDEM's *E. coli* TMDL approach is based upon the premise that all point and nonpoint source discharges must meet the WQS when entering the water body. If all sources meet the WQS at discharge, then the water body should meet the WQS and its designated use.

Section 5 – **Wasteload Allocations **

Original Decision Document language: IDEM identified four NPDES permit holders (Table 3 of this Decision Document) within the Otter Creek Watershed which received a portion of the WLA assigned to mitigate bacteria inputs. Individual WLAs were developed as part of the TMDL development process for those permittees discharging directly to impaired reaches. WLAs for individual facilities were calculated based on each facility's design flow and the permit limit (ex. *E. coli* permit limits are set at the WQS of 125 cfu/100 mL). IDEM expects each NPDES permitted facility to meet the concentration targets assigned in the WLA across all flow conditions.

Revised Decision Document language: IDEM identified four NPDES permit holders (Table 3 of this Decision Document) within the Otter Creek Watershed which received a portion of the WLA assigned to mitigate bacteria inputs. Individual WLAs were developed as part of the TMDL development process for those permittees discharging directly to impaired reaches. WLAs for individual facilities were calculated based on each facility's design flow and the permit limit (e.g., *E. coli* permit limits are set at the WQS of 235 cfu/100 mL). IDEM expects each NPDES permitted facility to meet the concentration targets assigned in the WLA across all flow conditions.

Section 6 – **Margin of Safety (MOS) **

Original Decision Document language: As stated in *EPA's Protocol for Developing Pathogen TMDLs* (EPA 841-R-00-002), many different factors affect the survival of pathogens, including the physical condition of the water. These factors include, but are not limited to sunlight, temperature, salinity, and nutrient deficiencies. These factors vary depending on the environmental condition/circumstances of the water, and therefore it would be difficult to assert that the rate of decay caused by any given combination of these environmental variables was sufficient enough to meet the WQS of 125 cfu/100 mL and 235 cfu/100ml.

Revised Decision Document language: As stated in *EPA's Protocol for Developing Pathogen TMDLs* (EPA 841-R-00-002), many different factors affect the survival of pathogens, including the physical condition of the water. These factors include, but are not limited to sunlight, temperature, salinity, and nutrient deficiencies. These factors vary depending on the environmental condition/circumstances of the water, and therefore it would be difficult to assert that the rate of decay caused by any given combination of these environmental variables was sufficient enough to meet the WQS of 235 cfu/100mL and 125 cfu/100 mL. Thus, it is more conservative to apply the State's WQS in determining bacteria TMDLs, because this standard must be met at all times under all environmental conditions.