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

NOV - 1 2013

REPLY TO THE ATTENTION OF:
WW-16J

Bonny F. Elifritz
Chief, Watershed Planning & Restoration Section
Indiana Department of Environmental Management
MC 65-42 Shadeland
100 North Senate Avenue
Indianapolis, Indiana 46204-2251

Dear Ms. Elifritz:

The U.S. Environmental Protection Agency has reviewed the recent approval (dated September 20, 2013) of the Big Raccoon Creek Watershed (BRCW) Total Maximum Daily Load (TMDL) report. EPA has determined that there were errors within the approval letter and within Section 13 of the Decision Document. EPA accredited the Indiana Department of Environmental Management (IDEM) with completing TMDLs for fifty three (53) bacteria impaired segments and two (2) segments with impaired biotic communities (IBC) in the September 20th Decision Document. The IBC TMDLs were assigned to the total phosphorus TMDL calculations for segments INB08C1_T1004 and INB08C6_T1003 (Table 1 of the Decision Document).

Upon further review, EPA is recognizes that IDEM should have received credit for completing 53 bacteria TMDLs and 3 IBC TMDLs. In EPA's approval of September 20, 2013, IDEM received credit for 2 total phosphorus TMDLs to address IBC for segments INB08C1_T1004 and INB08C6_T1003. IDEM should have also been accredited for the total suspended solid TMDL to address IBC for segment INB08C6_T1003 (Table 1 of the Decision Document). This correction increases the total TMDLs approved by EPA for the BRCW from 55 TMDLs to 56 TMDLs.

EPA has corrected the original Decision Document, and I am enclosing a copy for your records. Please see Table 1 of the revised Decision Document for the final approved TMDL assessment units. If you have any questions, please contact Mr. David Werbach, TMDL Coordinator, at 312-886-4242.

Sincerely,

Peter Swenson

Peter Swenson
Chief, Watersheds & Wetlands Branch

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Enclosure

cc: Staci Goodwin, IDEM

TMDL: Big Raccoon Creek Watershed, Boone, Hendricks, Montgomery, Putnam and Parke Counties, Indiana
Date: November 1, 2013 (revised)

DECISION DOCUMENT
FOR THE BIG RACCOON 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 Big Raccoon Creek Watershed (BRCW) is located in west-central Indiana in Boone, Hendricks, Montgomery, Putnam and Parke Counties. The BRCW is approximately 215 square miles in size (approx. 137,600 acres). Big Raccoon Creek originates near the town of New Ross, Indiana and then flows southwest through the town of Ladoga, Indiana where it ultimately empties into the Cecil M. Harden Lake near the town of Portland Mills, Indiana. The BRCW TMDLs address impaired reaches on approximately 345-miles of streams within the BRCW and target impaired segments in tributaries to the main stem of Big Raccoon Creek. These segments have been identified as violating water quality standards (WQS) for bacteria (*Escherichia coli* (*E. coli*)) and impaired biotic communities (IBC).

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

- Headwaters of Big Raccoon Creek (05120108-12-01);
- Town of New Ross (05120108-12-02);
- Haw Creek (05120108-12-03);
- Cornstalk Creek (05120108-12-04);
- North Ramp Creek (05120108-12-05);
- Little Raccoon Creek (05120108-12-06); and
- Byrd Branch (05120108-12-07).

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

Water quality within the BRCW 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 fifty-three (53) segments within the BRCW exceeded bacteria water quality standards and two (2) segments showed impairments related to biotic communities. IDEM determined that the likely cause for impaired biotic communities was linked to elevated concentrations of total suspended solids and total phosphorus. Reaches addressed via this TMDL within the Big Raccoon Creek watershed were listed on Indiana's 2008 and 2010 303(d) lists.

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

2014 AUID	Impaired Beneficial Use	Action	Bacteria TMDL	IBC TMDL	
				Total Phosphorus (TP) TMDL	Total Suspended Sediment (TSS) TMDL
Headwaters Big Raccoon Creek Subwatershed (05120108-12-01)					
INB08C1_01	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C1_T1001	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C1_T1002	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C1_T1003	Recreation Use (bacteria)	Bacteria TMDL	1		

INB08C1_T1004	Recreation Use (bacteria) & Aquatic Life Use (IBC)	Bacteria TMDL & IBC TMDL (TP)	1	1	
Town of New Ross Subwatershed (05120108-12-02)					
INB08C2_02	Recreation Use (bacteria)	Bacteria TMDL	1		
INC08C2_T1011	Recreation Use (bacteria)	Bacteria TMDL	1		
INC08C2_T1012	Recreation Use (bacteria)	Bacteria TMDL	1		
INC08C2_T1013	Recreation Use (bacteria)	Bacteria TMDL	1		
Haw Creek Subwatershed (05120108-12-03)					
INB08C3_01	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C3_02	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C3_T1001	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C3_T1002	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C3_T1003	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C3_T1004	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C3_T1005	Recreation Use (bacteria)	Bacteria TMDL	1		
Cornstalk Creek Subwatershed (05120108-12-04)					
INB08C4_01	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C4_T1001	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C4_T1002	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C4_T1003	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C4_T1004	Recreation Use (bacteria)	Bacteria TMDL	1		
North Ramp Creek Subwatershed (05120108-12-05)					
INB08C5_01	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C5_T1001	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C5_T1002	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C5_T1003	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C5_T1004	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C5_T1005	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C5_T1006	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C5_T1007	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C5_T1008	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C5_02	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C5_T1009	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C5_T1010	Recreation Use (bacteria)	Bacteria TMDL	1		
Little Raccoon Creek Subwatershed (05120108-12-06)					
INB08C6_01	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C6_T1001	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C6_02	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C6_T1002	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C6_03	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C6_T1003	Recreation Use (bacteria) & Aquatic Life Use (IBC)	Bacteria TMDL & IBC TMDL (TP & TSS)	1	1	1
INB08C6_T1004	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C6_T1005	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C6_T1006	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C6_T1007	Recreation Use (bacteria)	Bacteria TMDL	1		

Byrd Branch Subwatershed (05120108-12-07)					
INB08C7_01	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C7_T1001	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C7_T1002	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C7_T1003	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C7_T1004	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C7_T1005	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C7_T1006	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C7_02	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C7_T1007	Recreation Use (bacteria)	Bacteria TMDL	1		
INB08C7_T1008	Recreation Use (bacteria)	Bacteria TMDL	1		
		Totals:	53	2	1
			Bacteria	**IBC (TP)**	**IBC (TSS)**

Land Use:
The Big Raccoon Creek watershed encompasses approximately 137,900 acres within west-central Indiana. Land use in the BRCW is comprised of cultivated crop lands (agriculture), forested lands, pasture/hay, developed lands, open water shrub/scrub lands, and wetlands. Land use coverage from the 2006 National Land Cover Dataset (NLCD) was utilized to calculate the percentages of land cover within the BRCW. Cultivated crop lands (72.92%) and forested lands (12.93%) accounted for two of the largest land cover categories. The distribution of land use within the BRCW is found in Table 2 of this Decision Document.

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

Land Use Category Description	Acreage	Square Miles	Distribution (% of the total area in the Big Raccoon Creek Watershed)
Agriculture	100,556	157.12	72.92%
Forested Land	17,825	27.85	12.93%
Pasture/Hay	7,640	11.94	5.54%
Developed, Open Space	7,173	11.21	5.20%
Open Water	2,168	3.39	1.57%
Shrub/Scrub	1,549	2.42	1.12%
Developed, Low Intensity	790	1.23	0.57%
Developed, Medium Intensity	95	0.15	0.07%
Wetlands	84	0.13	0.06%
Developed, High Intensity	19	0.03	0.01%
TOTAL	137,899.00	215.47	1.00

Problem Identification:
IDEM conducted water quality sampling within the BRCW in 2005 and 2010 and detected exceedances of water quality standards for bacteria and stressed conditions for biotic communities. Impaired reaches were listed on Indiana's 303(d) list for recreational use impairments (due to bacteria exceedances of the numeric WQS) and aquatic life use impairments (due to IBC exceedances of the narrative WQS). 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.

Degradations in aquatic habitats or water quality (ex. flow alterations or organic enrichment) can negatively impact aquatic life use. TMDLs were completed for TP and TSS to address the aquatic life use impairments related to IBC. Nutrient enrichment, by phosphorus, can increase turbidity and support algal growth. Increased turbidity and algal growth can reduce dissolved oxygen in the water column, and cause large shifts throughout the day in dissolved oxygen and pH. Shifting chemical conditions within the water column may stress aquatic biota. In some instances, degradations in aquatic habitats or water quality have reduced fish populations or altered fish communities from those communities supporting sport fish species to communities which support rough fish species.

Excess siltation and flow alteration in streams may impact aquatic life by altering habitats. Excess sediment can fill pools, embed substrates, and reduce connectivity between different stream habitats. The result is a decline in habitat types that in healthy streams support diverse macroinvertebrate communities. Excess sediment can also reduce spawning and rearing habitats for certain fish species. In addition, excess suspended sediment can clog the gills of fish and thus reduce fish health. Flow alterations within the BRCW due to drainage improvements on or near agricultural lands, have in some instances resulted in increased peak flows. Higher peak flows in stream environments, which typically occur during storm events, can carry increased sediment loads to streams and erode streambanks. In the BRCW, IDEM has noted that deposited fine sediments have embedded substrates leading to habitat loss. Similar to the nutrient effects discussed above, this may result in reduced fish populations or altered fish communities from those communities supporting sport fish species to communities which support rough fish species.

Priority Ranking:
The BRCW 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:
Recreational Use: The pollutant of concern for full body contact recreational use impairment is *E. coli* which is an indicator for pathogenic bacteria.

Aquatic Community Support: 327 IAC 2-1-3(a)(2)(A) states that all surface waters should be capable of supporting a well-balanced, warm water aquatic community. The pollutants of concern for aquatic life use impairment are excess sediment (TSS) and excess nutrients (TP).

Source Identification (point and nonpoint sources):
Point Source Identification: The potential **point sources for the BRCW bacteria TMDLs** 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 four NPDES permit holders in the BRCW which were assigned a portion of the wasteload allocation (WLA) (Table 3 in this Decision Document).

Table 3: Permitted NPDES dischargers in the Big Raccoon Creek watershed

NPDES ID	Facility Name	Subwatershed	Receiving Water	Design Flow (mgd)[1]	*Permit Limit for E. coli (Billion of orgs / day)*
IN0039705	Town of Advance WWTP	Big Raccoon Creek	Big Raccoon Creek (INB08C1_01)	0.039	0.14
IN0059790	New Ross WWTP	Big Raccoon Creek	Big Raccoon Creek (INB08C1_01)	0.33	1.23
IN0023418	Town of Lagoda WWTP	Little Raccoon Creek	Big Raccoon Creek (INB08C6_01)	0.25	0.93
IN0020052	Town of Roachdale WWTP	Little Raccoon Creek	Cline Creek (INB08C6_T1002)	0.16	0.59

1 = Maximum design flow

Municipal Separate Storm Sewer Systems (MS4): Stormwater from MS4s can transport bacteria to surface water bodies during or shortly after storm events. There are no MS4 communities within the BRCW.

Sanitary Sewer Overflows (SSOs): SSOs may deliver bacteria to waterways during or shortly after storm events. IAC Article 15, Industrial Wastewater Pretreatment Programs and NPDES includes regulations specific to communities experiencing sanitary sewer overflows. There are two SSOs within the BRCW (Table 4 of this Decision Document).

Table 4: SSOs in the Big Raccoon Creek watershed

NPDES ID	Facility Name	Subwatershed	Receiving Water
IN0020052	Town of Roachdale WWTP	Hawk Creek subwatershed	Lick Creek (INB08C3_02)
IN0020052	Town of Roachdale WWTP	Little Raccoon Creek subwatershed	Cline Creek (INB08C6_1002)

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

The potential **point sources for the BRCW IBC TMDLs (addressed via TP and TSS TMDLs)** are:

NPDES permit holders: NPDES permitted facilities may contribute nutrient and sediment pollutant loads to surface waters through facility discharges of treated wastewater. Permitted facilities may discharge treated wastewater according to their NPDES permit. No NPDES permitted facilities discharge to the IBC impaired segments.

Municipal Separate Storm Sewer Systems (MS4): Stormwater from MS4s can transport nutrients (total phosphorus) and sediment (TSS) to surface water bodies during or shortly after storm events. There are no MS4 communities within the BRCW.

SSOs: SSOs may deliver nutrients (total phosphorus) and sediment (TSS) to waterways during or shortly after storm events. IAC Article 15, Industrial Wastewater Pretreatment Programs and NPDES includes regulations specific to communities experiencing sanitary sewer overflows. IDEM explained that the receiving waters for the SSOs identified in Table 4 of this Decision Document are not the same segments which are identified as the IBC impaired segments.

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

Nonpoint Source Identification: The potential **nonpoint sources for the BRCW bacteria TMDLs** are:

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.

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 one CFO within the BRCW (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: CFOs in the Big Raccoon Creek watershed

Farm ID	Facility Name	AUID	Subwatershed	Animals
6664	Demaree Farms Partnership	INB08C1_T1004	Big Raccoon Creek subwatershed	640 beef cattle & 60 beef calves

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 BRCW. 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.

Stormwater runoff from agricultural land use practices: Runoff from agricultural lands may contain significant amounts of bacteria which may lead to impairments in the BRCW. 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.

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.

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

The potential **nonpoint sources for the BRCW IBC TMDLs (addressed via TP and TSS TMDLs)** are:

Urban runoff: Runoff from urban areas (urban, residential, commercial or industrial land uses) can contribute various pollutants, including nutrients and sediments to local water bodies. Stormwater from urban areas, which drain impervious surfaces, may introduce pollutants to surface waters. The sources of nutrients in stormwater include: decaying vegetation (leaves, grass clippings, etc.), domestic and wild animal wastes, soil particles, atmospheric deposited particles, and phosphorus-containing fertilizers. Stormwater from urban areas which drain impervious surfaces may add sediment and other particulate matter to local surface waters. Channelized stormwater conveyance systems may transport untreated stormwater, which may contain mobilized soil particulate materials, to 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 one CFO within the BRCW (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 stormwater flows. Tile lined fields and channelized ditches enable nutrients and sediment to move more efficiently into surface waters.

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 nutrients within the BRCW. 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.

Stormwater runoff from agricultural land use practices: Runoff from agricultural lands may contain significant amounts of nutrients and sediment which may lead to impairments in the BRCW. Manure spread onto fields is often a source of nutrients, and can be exacerbated by tile drainage lines, which

channelize the stormwater flows. Tile lined fields and channelized ditches enable nutrients and sediment to move more efficiently into surface waters. Stormwater may contribute sediment inputs to surface waters as water moves over cropland and feedlots. Fields that utilize tile drains may enhance erosion on the fields and in the drainage ditches. Overgrazing by livestock may also augment soil loss from fields.

Unrestricted livestock access to streams: Livestock with access to stream environments may add nutrients directly to the surfaces waters or resuspend particles that had settled on the stream bottom. Direct deposition of animal wastes can result in very high localized nutrient concentrations and may contribute to downstream impairments. Smaller animal facilities may add nutrients to surface waters via wastewater from these facilities or stormwater runoff from near-stream pastures. Additionally, livestock in streams or on streambanks destabilizes the streambanks and may lead to streambank degradation and erosion. Livestock within the stream may re-suspend sediments which have settled on the stream bottom and also may displace aquatic plants whose roots provide stability for stream sediment. The loss of these aquatic plants may lead to sediment erosion during stormwater events.

Stream channelization and stream erosion: Eroding streambanks and channelization efforts may add sediment to local surface waters. Nutrients may be added if there is particulate phosphorus bound with eroding soils. Eroding riparian areas may be linked to soil inputs within the water column and potentially to changes in flow patterns. Changes in flow patterns may encourage down-cutting of the streambed and streambanks. Stream channelization efforts can increase the velocity of flow (via the removal of the sinuosity of a natural channel) and disturb the natural sedimentation processes of the streambed.

Atmospheric deposition: Nutrients and sediment may be added via particulate deposition. Particles from the atmosphere may fall onto surface waters or other surfaces within the BRCW.

Forest Sources: Nutrients and sediment may be added to surface waters via runoff from forested areas within the watershed. Runoff from forested areas may include debris from decomposing vegetation and organic soil particles.

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

Future Growth:
Significant development is not expected in the BRCW. IDEM anticipates that the primary categories of land use within the BRCW, agricultural lands forested lands and, will remain unchanged in the BRCW. 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, the nutrient TMDLs or the sediment TMDL 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 BRCW 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 BRCW 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.

Aquatic Life Use: 327 IAC 2-1-3(a)(2)(A) states that all surface waters, except as described in subdivision (5), will be capable of supporting a well-balanced, warm water aquatic community. Furthermore, at all times, all surface waters outside of mixing zones shall be free of substances in concentrations that on the basis of available scientific data are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants (327 IAC 2-1-6(a)(2)).

Currently IDEM has not developed numeric criteria for TP and TSS. Water quality target (WQT) values were established by IDEM to improve water quality within water bodies to support well balanced aquatic communities. In several tributaries to Big Raccoon Creek, low dissolved oxygen and poor habitat were also identified as potential stressors contributing to biotic community impairments. Low dissolved oxygen is often the result of elevated nutrient levels (TP), while habitat problems are generally associated with higher sediment concentrations.

The State of Indiana strives to achieve waters free from substances that, "contribute to the growth of nuisance plants or algae." IDEM believes that exceedances of TSS and TP are impacting biological communities within portions of the BRCW. Impaired biological community segments identified during IDEM's water quality assessments in 2005 and 2010 are thought to be influenced by increased concentrations of TSS and or TP. IDEM employed water quality target values for TP and TSS in order to evaluate which of the two parameters were affecting the biology of the segment. For certain IBC segments within the BRCW it was determined, based on the water quality data collected in that segment, that the biology within that segment was impacted by both parameters (TP and TSS) (Table 1 of this Decision Document). The baselines IDEM used to determine which parameters were impacting IBC segments were water quality target values for TP and TSS.

IDEM utilized a WQT of **30 mg/L for TSS**. The TSS WQT of 30 mg/L was chosen to interpret the narrative sediment criteria (327 IAC 2-1-6). IDEM employed a WQT of **0.3 mg/L for TP** for assessing stream segments which may be contributing nutrient inputs to those reaches with impaired biological communities. The TP WQT of 0.3 mg/L is based on a narrative nutrient criteria described in 327 IAC 2-1-6 and is intended to limit the negative effects on aquatic ecosystems that can occur due to increasing algal and aquatic plant life production associated with higher nutrient concentrations.

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

Parameter	Units	Water Quality Criteria	TMDL development targets
Numeric Water Quality Standards for Bacteria impaired segments within the BRCW			
E. Coli [1]	#/100 mL	Numeric	235 single sample maximum
		Numeric	Geometric mean < 125 [2]
Narrative Water Quality Targets for Impaired Biotic Community (IBC) segments within the BRCW			
Total Phosphorus (TP)	mg/L	Narrative	0.3
Total Suspended Solids (TSS)	mg/L	Narrative	30

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 BRCW 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, nutrients and sediments. The LDC approach assigns loadings based on flow.

Bacteria (E. coli) TMDLs: For all *E. coli* TMDLs addressed by the BRCW 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.

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 BRCW, IDEM used Indiana's water quality standards 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 the designated use.

IDEM approached the BRCW TMDLs by calculating loading capacity values for individual impaired segments within the seven HUC-12 watersheds (05120108-12-01, 05120108-12-02, 05120108-12-03, 05120108-12-04, 05120108-12-05, 05120108-12-06 and 05120108-12-07). For example, impaired reaches (ex. INB08C1_01 or INB08C3_T1004) were assigned to their respective HUC-12 watershed based on the location of each impaired reach within the BRCW. All reaches designated as impaired due to bacteria by IDEM were assigned an individual TMDL for bacteria (Table 7 of this Decision Document).

IDEM determined that assigning a load to cover multiple impaired reaches within a HUC-12 subwatershed, instead of individual loads for each reach, was appropriate because land use characteristics within each HUC-12 subwatershed were consistent across the HUC-12 subwatershed containing multiple reaches. The consistency in land use within HUC-12 subwatersheds provides assurance that implementation efforts within the HUC-12 subwatershed will meet the TMDL loads assigned at the subwatershed outlet point.

Flow duration curves (FDC) were created for each of the subwatersheds within the BRCW. The FDC were developed from flow frequency tables based on recorded and scaled flow volumes measured at a USGS gage on the mainstem of Big Raccoon Creek in Fincastle, Indiana (USGS gage ID #03340800). 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 this location were utilized to characterize the flows within other subwatersheds in the BRCW. 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 Big Raccoon Creek (#03340800) 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 BRCW (#03340800)

$A_{ungaged}$ = Drainage area of the ungaged location
A_{gaged} = Drainage area of the gaged location, in the case of the BRCW (#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) and SSOs 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 BRCW 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 BRCW 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 bacteria water quality monitoring in the BRCW basin in 2010 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 subwatershed in the BRCW. WLA were assigned to NPDES permitted facilities 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 Big Raccoon 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 Big Raccoon Creek Subwatershed (05120108-12-01)					
5 Segments: INB08C1_01, INB08C1_T1001, INB08C1_T1002, INB08C1_T1003 & INB08C1_T1004					
Bacteria TMDL (billions of bacteria/day)	**615.02**	**153.48**	**62.30**	**19.26**	**4.30**
Wasteload Allocation (WLA): Total	1.37	1.37	1.37	1.37	1.37
Town of Advance WWTP (IN0039705)	0.14	0.14	0.14	0.14	0.14
New Ross WWTP (IN0059790)	1.23	1.23	1.23	1.23	1.23
Load Allocation (LA)	552.15	136.76	54.70	15.96	2.50
Margin Of Safety (MOS) (10%)	61.50	15.35	6.23	1.93	0.43
Town of New Ross Subwatershed (05120108-12-02)					
4 Segments: INB08C2_02, INB08C2_T1011, INB08C2_T1012 & INB08C2_T1013					
Bacteria TMDL (billions of bacteria/day)	**428.84**	**108.03**	**44.66**	**14.74**	**4.37**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	386.09	97.37	40.33	13.41	4.07
Margin Of Safety (MOS) (10%)	42.75	10.66	4.33	1.33	0.30
Haw Creek Subwatershed (05120108-12-03)					
7 Segments: INB08C3_01, INB08C3_02, INB08C3_T1001, INB08C3_T1002, INB08C3_T1003, INB08C3_T1004 & INB08C3_T1005					
Bacteria TMDL (billions of bacteria/day)	**626.68**	**156.38**	**63.48**	**19.62**	**4.39**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	564.01	140.74	57.13	17.66	3.95

Margin Of Safety (MOS) (10%)	62.67	15.64	6.35	1.96	0.44
Cornstalk Creek Subwatershed (05120108-12-04)					
5 Segments: INB08C4_01, INB08C4_T1001, INB08C4_T1002, INB08C4_T1003 & INB08C4_T1004					
Bacteria TMDL (billions of bacteria/day)	**454.61**	**113.44**	**46.04**	**14.23**	**454.61**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	409.15	102.10	41.44	12.81	2.86
Margin Of Safety (MOS) (10%)	45.46	11.34	4.60	1.42	0.32
North Ramp Creek Subwatershed (05120108-12-05)					
12 Segments: INB08C5_01, INB08C5_T1001, INB08C5_T1002, INB08C5_T1003, INB08C5_T1004, INB08C5_T1005, INB08C5_T1006, INB08C5_T1007, INB08C5_T1008, INB08C5_02, INB08C5_T1009 & INB08C5_T1010					
Bacteria TMDL (billions of bacteria/day)	**742.21**	**185.21**	**75.18**	**23.23**	**5.19**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	667.99	166.69	67.66	20.91	4.67
Margin Of Safety (MOS) (10%)	74.22	18.52	7.52	2.32	0.52
Little Raccoon Creek Subwatershed (05120108-12-06)					
10 Segments: INB08C6_01, INB08C6_T1001, INB08C6_02, INB08C6_T1002, INB08C6_03, INB08C6_T1003, INB08C6_T1004, INB08C6_T1005, INB08C6_T1006 & INB08C6_T1007					
Bacteria TMDL (billions of bacteria/day)	**1031.43**	**257.39**	**104.48**	**32.30**	**7.21**
Wasteload Allocation (WLA): Total	1.52	1.52	1.52	1.52	1.52
Town of Lagoda WWTP (IN0023418)	0.93	0.93	0.93	0.93	0.93
Town of Roachdale WWTP (IN0020052)	0.59	0.59	0.59	0.59	0.59
Load Allocation (LA)	926.77	230.12	92.51	27.54	4.97
Margin Of Safety (MOS) (10%)	103.14	25.75	10.45	3.24	0.72
Byrd Branch Subwatershed (05120108-12-07)					
10 Segments: INB08C7_01, INB08C7_T1001, INB08C7_T1002, INB08C7_T1003, INB08C7_T1004, INB08C7_T1005, INB08C7_T1006, INB08C7_02, INB08C7_T1007 & INB08C7_T1008					
Bacteria TMDL (billions of bacteria/day)	**427.49**	**107.82**	**44.66**	**14.87**	**4.51**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	384.89	97.19	40.35	13.53	4.21
Margin Of Safety (MOS) (10%)	42.60	10.63	4.31	1.34	0.30

Table 8 of the Decision Document discusses IDEM's estimates of loading reductions for selected segments in the BRCW. These loading reductions (i.e., the percent reduction column) were calculated from field sampling data collected in the BRCW by IDEM in April – May 2010 (Appendix C of the final TMDL document). Flow conditions in these selected water bodies in April – May 2010 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 BRCW when the TMDLs are achieved.

Table 8: Bacteria (*E. coli*) Load Reductions for the Big Raccoon 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 / 100 mL)
				125	*235*		
Headwaters of Big Raccoon Creek	WLV160-0063	INB08C1_01	5	100	100	1777.94	92.97
Town of New Ross	WLV160-0045	INB08C2_02	5	100	100	2136.8	94.15
Haw Creek	WLV160-0027	INB08C3_01	5	100	100	2104.12	94.06
	WLV160-0064	INB08C3_02	5	100	100	1187.68	89.48
Cornstalk Creek	WLV160-0035	INB08C4_01	5	100	80	543.13	76.99
	WLV160-0038		5	100	100	2214.29	94.35
North Ramp Creek	WLV160-0068	INB08C5_02	5	100	100	1062.79	88.24
	WLV160-0015		5	100	80	819.58	84.75
Little Raccoon Creek	WLV160-0025	INB08C6_01	5	100	100	1473.45	91.52
	WLV160-0044	INB08C6_T1001	5	100	100	1589.6	92.14
	WLV160-0065	INB08C6_02	5	100	100	1680.05	92.56
	WLV160-0066	INB08C6_T1002	5	100	100	1562.21	92
	WLV160-0002	INB08C6_03	5	100	100	1158.67	89.21
	WLV160-0067	INB08C6_T1003	5	100	100	1955.49	93.61
Byrd Branch	WLV160-0070	INB08C7_01	5	100	100	1235.28	89.88

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 Big Raccoon Creek watershed TMDLs. The methods used for determining the TMDL are consistent with U.S. EPA technical memos.[1]

IBC TMDLs (addressed via TP and TSS TMDLs): IBC segments addressed by TMDLs for TP and TSS were developed in a similar fashion to the bacteria TMDLs. For the TP and TSS TMDLs, the WQT for each parameter was used to set the loading capacity of the TMDL. These targets are TSS (30 mg/L) and TP (0.3 mg/L). IDEM incorporated the LDC approach to calculate pollutant loadings for each of these parameters at the outlet points of subwatersheds (HUC-12 scale) within the BRCW. Impaired reaches were assigned to their respective subwatershed based on the location of the reach within the BRCW.

Flow measurements from the mainstem Big Raccoon Creek USGS gage (#03340800) were incorporated to develop FDC and the Drainage Area Weighting Equation was utilized to estimate flows in ungaged

[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.

subwatersheds. IDEM completed water quality monitoring for TP & TSS in the BRCW basin in 2005 and 2010. TP and TSS concentrations were sampled at specific sampling points within the Big Raccoon Creek watershed. TP and TSS 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, moist conditions, "normal" range flows, dry conditions, and low flows. 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 WQT 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 WQT.

TMDLs were calculated for the Headwaters of Big Raccoon Creek subwatershed (05120108-12-01) and the Little Raccoon Creek subwatershed (05120108-12-06). No WLAs were assigned to NPDES permitted facilities for the nutrient and sediment TMDLs (WLA = 0). 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, urban stormwater runoff etc.). Instead, load allocations were represented as one value for each TMDL. EPA is approving the load(s) expressed in the current TMDLs.

Table 9 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 TP and TSS monitoring data and allows for the estimation of load reductions necessary for attainment of the TP and TSS water quality targets. 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 9 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 9: Total Phosphorus and Total Suspended Solids TMDLs for the Big Raccoon Creek Watershed

Flow Regime TMDL analysis Total Phosphorus (lbs/day)	High	Moist Conditions	Normal Flows	Dry Conditions	Low Flows
Duration Interval	0 - 10 %	10 - 40 %	40 - 40 %	60 - 90 %	90 - 100 %
Headwaters Big Raccoon Creek Subwatershed (05120108-12-01)					
1 Segment: INB08C1_T1004					
TP TMDL (lbs/day)	**19.29**	**4.81**	**1.95**	**0.60**	**0.13**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	17.36	4.33	1.75	0.54	0.12
Margin Of Safety (MOS) (10%)	1.93	0.48	0.20	0.06	0.01

Little Raccoon Creek Subwatershed (05120108-12-06)					
1 Segment: INB08C6_T1003					
TP TMDL (lbs/day)	**24.30**	**6.07**	**2.46**	**0.76**	**0.17**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	21.87	5.46	2.21	0.68	0.15
Margin Of Safety (MOS) (10%)	2.43	0.61	0.25	0.08	0.02
TSS TMDL (lbs/day)	**2391.88**	**599.37**	**243.29**	**75.20**	**16.81**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	2151.69	539.43	218.96	67.68	15.13
Margin Of Safety (MOS) (10%)	240.19	59.94	24.33	7.52	1.68

Table 10 of the Decision Document discusses IDEM's estimates of loading reductions for selected segments in the BRCW. These loading reductions (i.e., the percent reduction column) were calculated from field sampling data collected in the BRCW by IDEM in August 2005 (Appendix C of the final TMDL document). Flow conditions in these selected water bodies in August 2005 were illustrative of the 'low flow' flow regime of the flow duration curve. IDEM has communicated the loading reductions in Table 10 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 BRCW when the TMDLs are achieved.

Table 10: Total Phosphorus (TP) and Total Suspended Sediment (TSS) Load Reductions for the Big Raccoon Creek Watershed

Subwatershed	Station #	AUID	Parameter	Total Number of Samples	Percent of Samples Violating Target	Maximum (mg/L)	Percent Reduction Based on Concentration
Headwaters of Big Raccoon Creek	WLV160-0017	INB08C1_T1004	TP	1	100	0.68	74.57
Little Raccoon Creek	WLV160-0039	INB08C6_T1003	TP	1	100	0.33	44.5
Little Raccoon Creek	WLV160-0039	INB08C6_T1003	TSS	1	100	74	75

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 Big Raccoon Creek watershed TMDLs. The methods used for determining the TMDL are consistent with U.S. EPA technical memos.[2]

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

[2] 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.

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 (125 cfu/100 mL) and the WQT for TSS (30 mg/L) and TP (0.3 mg/L). The WQS and WQT were applicable across all flow conditions in the subwatershed (Tables 7 and 8 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 BRCW 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 2005 and 2010. 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:

Bacteria (E. coli) TMDLs:

IDEM identified four NPDES permit holders (Table 3 of this Decision Document) within the BRCW 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.

There are no MS4 communities within the BRCW. There is one SSO community within the BRCW, the Town of Roachdale (NPDES ID IN0020052). The SSO was not assigned a portion of the WLA for SSO inputs (WLA = 0 cfu per 100 mL). There are no CAFOs in the watershed boundaries of the BRCW and therefore, WLA attributed to contributions from CAFOs were set to zero (WLA = 0).

IBC TMDLs (addressed via TP and TSS TMDLs):

IDEM did not assign a portion of the total phosphorus TMDL to the WLA (Table 9 of this Decision Document) nor did IDEM assign a portion of the total suspended solid TMDL to the WLA (Table 9 of this Decision Document). IDEM explained that NPDES permitted facilities in the BRCW do not discharge to the IBC impaired segments.[3] Also, IDEM explained that receiving waters for SSO discharges were not the same segments as those identified as the IBC impaired segments. Therefore, WLAs were set to zero for the total phosphorus and total suspended solid TMDLs (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

[3] Big Raccoon Creek TMDL document, page 126, Table 67.

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, nutrient and sediment 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 (Tables 7 & 8 of this Decision Document). The use of the LDC approach minimized variability associated with the development of the BRCW 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, basing assumptions on water quality monitoring with low sample sizes, and imperfect WQT. A 10% MOS was considered appropriate, because the target values used in this TMDL had a firm technical basis and the estimated flows are believed to be relatively accurate because they were estimated based on a USGS gage located within the watershed.

The MOS for the BRCW 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 BRCW 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*) and nutrient (TP) and sediment (TSS) TMDLs incorporated seasonal variation into the development of the BRCW TMDLs via the following methods:

Bacteria (E. coli) 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 1st to October 31st), 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 BRCW and thereby accounted for seasonal variability over the recreation season. TMDL loads were based on sampling that occurred during the recreational season in 2005 and 2010. 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).

IBC TMDLs (addressed via TP and TSS TMDLs): The attainment of nutrient and sediment water quality targets is expected to create conditions within the water column which support a well-balanced biological community (Section 2 of this Decision Document). To reach these conditions, the nutrient and sediment TMDLs needed to account for seasonal variations in flow within the water body. This was accomplished by the use of LDCs based on a local USGS gage's flow data. These flow measurements represented a variety of flow conditions within the watershed. IDEM explained that seasonal variability within the BRCW was captured by the utilization of a large set of flow data which embodied a wide range of flow conditions in the watershed.

Given the amount of agricultural land use in the watershed, nutrient (phosphorus) and sediment loadings in the BRCW vary with agricultural activity. Nutrient and sediment inputs to surface waters typically occur primarily through wet weather events. Critical conditions that impact the response of BRCW water bodies to nutrients and sediments occur in periods of low flow. During low flow periods, nutrients and sediment can accumulate, there is less assimilative capacity within the water body, and generally nutrients and sediment are not transported through the water body at the same rate they are under normal flow conditions.

Increased algal growth during low flow periods can deplete dissolved oxygen within the water column. Critical conditions that impact loading, or the rate that nutrients are delivered to the water body, were identified as those periods where large precipitation events coincide with periods of minimal vegetative cover on fields. Large precipitation events and minimally covered land surfaces can lead to large runoff volumes, especially to those areas which drain agricultural fields. The conditions generally occur in the spring and early summer seasons.

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 BRCW TMDL was the one of the first TMDL projects 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 BRCW TMDLs provide reasonable assurance 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 BRCW. 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 BRCW. These partners are the: Indiana State Department of Agriculture (ISDA), U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS), the Nature Conservancy, Boone, Hendricks, Montgomery, Putnam and Parke County Health Departments, the West Central Indiana Economic Development District, and Soil and Water Conservation Districts (SWCDs) for Boone, Hendricks, Montgomery, Putnam and Parke 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 BRCW 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).

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* and nutrients 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 BRCW 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 Boone, Hendricks, Montgomery, Putnam and Parke 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 BRCW watershed. Putnam Country received 319 money in 2010 to improve water quality via nonpoint source restoration activities. BMPs were installed to aid in the reduction of bacteria and nutrient inputs to surface waters in the BRCW 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 BRCW in 2005 and 2010 as part of its basin monitoring schedule. Water quality data were collected at various locations within the BRCW and those assessments were utilized to develop the TMDLs in this report. Future monitoring in the BRCW 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*), nutrient and sediment 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, nutrient and sediment 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 pollutant targets are being achieved and adjust the BRCW 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, nutrient, and sediment inputs to the surface waters in the BRCW. Local partners will bear the responsibility for assisting in the management of public lands and waters within the BRCW. These partners will also be tasked with finding creative adaptive management strategies to meet changing water quality conditions within the watershed. The main bacterial, nutrient and sediment reduction strategies include:

Bacteria (E. coli TMDLs):
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 BRCW.

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 BRCW.

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.

IBC TMDLs (addressed via TP TMDLs):

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 nutrient inputs to the BRCW.

Urban/Residential Nutrient Reduction Strategies: These strategies involve reducing stormwater runoff from urban areas and single family residences within the BRCW. These practices could include; rain gardens, lawn fertilizer reduction, planting buffer strips near water bodies, vegetation management and replacement of failing septic systems. Water quality educational programs could also be utilized to inform the general public on nutrient reduction efforts and their impact on water quality.

Agricultural Reduction Strategies: These strategies involve reducing nutrient transport from fields and minimizing soil loss. Specific practices would include; planting buffer strips near streams and lakes, streambank stabilization practices (gully stabilization and installation of fencing near streams), wetland restoration, and nutrient management planning.

Public Education Efforts: Public programs will be developed to provide guidance to the general public on nutrient reduction efforts and their impact on water quality. These educational efforts could also be used to inform the general public on what they can do to protect the overall health of the BRCW. Local watershed partners (ex. NRCS or county SWCDs) could assume addition responsibilities in communicating nutrient reduction strategies to stakeholders.

IBC TMDLs (addressed via TSS TMDLs):
Reducing stormwater peak flows within surface water bodies in the BRCW is the primary recommendation for reducing sediment loads in the watershed. Streamside buffering, particularly via wetland restoration or construction, is a recommended practice that would reduce both sediment and other related pollutant loads, and in some cases may help mitigate flow alteration by maximizing infiltration rates.

Urban-suburban Stormwater Mitigation Efforts: Reducing peak flow stormwater inputs within the BRCW would aid in reducing erosion and streambank losses within the watershed. This practice may be accomplished via reducing impervious cover or employing other low impact development/ green technologies which allow stormwater to infiltrate, evaporate or evapotranspire before reaching the stormwater conveyance system.

Identification of Stream and River Erosional Areas: An assessment of stream and river channel erosional areas should be completed to evaluate areas where erosion control strategies could be implemented in the BRCW. Implementation actions (ex. planting deep-rooted vegetation near water bodies to stabilize streambanks) could be prioritized to target areas which are actively eroding. This strategy could prevent additional sediment inputs into surface waters of the BRCW and minimize or eliminate degradation of habitat.

Improved Agricultural Drainage Practices: A review of local agricultural drainage networks should be completed to examine how improving drainage ditches and drainage channels could be reorganized to reduce the influx of sediments to the surface waters in the BRCW. The reorganization of the drainage network could include the installation of drainage ditches or sediment traps to encourage particle settling during high flow events. Additionally, cover cropping and residue management is recommended to reduce erosion and thus siltation and runoff into streams.

Reducing Livestock Access to Stream Environments: Livestock managers should be encouraged to implement measures to protect riparian areas. Managers should install exclusion fencing near stream environments to prevent direct access to these areas by livestock. Additionally, installing alternative watering locations and stream crossings between pastures may aid in reducing sediments to surface waters.

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 draft TMDL meeting was held on June 26, 2013 in Bainbridge, Indiana at the Bainbridge Community Building. 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 Big Raccoon Creek watershed group was notified by e-mail.

The draft TMDL report was available for public comment from June 26, 2013 to July 26, 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 BRCW TMDL during the public comment period. IDEM submitted the final TMDL and submittal letter to the U.S. EPA on August 28, 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 Big Raccoon Creek watershed TMDL document and submittal letter from the IDEM on August 28, 2013. The transmittal letter explicitly stated that enclosed was the final TMDL report detailing the BRCW TMDLs which address recreational use and aquatic life use impairments due to bacteria and nutrient and sediment inputs. The BRCW TMDLs include impaired reaches within the following seven HUC-12 subwatersheds within the BRCW;

- Headwaters of Big Raccoon Creek (05120108-12-01);
- Town of New Ross (05120108-12-02);
- Haw Creek (05120108-12-03);
- Cornstalk Creek (05120108-12-04);
- North Ramp Creek (05120108-12-05);
- Little Raccoon Creek (05120108-12-06); and

- Byrd Branch (05120108-12-07).

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 the BRCW 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 **fifty-six (56)** TMDLs submitted for the Big Raccoon Creek watershed satisfy all of the elements of approvable TMDLs. This approval is for **fifty-three (53) bacteria TMDLs, 2 total phosphorus TMDLs to address impaired biotic communities, and 1 total suspended solid TMDL to address impaired biotic community** (Table 1 of this Decision Document). These TMDLs address water bodies in seven HUC-12 subwatersheds (05120108-12-01, 05120108-12-02, 05120108-12-03, 05120108-12-04, 05120108-12-05, 05120108-12-06 & 05120108-12-07) for recreational use and aquatic life use impairments, for the BRCW. The water bodies within the seven subwatersheds include:

- Headwaters of Big Raccoon Creek (05120108-12-01);
- Town of New Ross (05120108-12-02);
- Haw Creek (05120108-12-03);
- Cornstalk Creek (05120108-12-04);
- North Ramp Creek (05120108-12-05);
- Little Raccoon Creek (05120108-12-06); and
- Byrd Branch (05120108-12-07).

The U.S. EPA's approval of these TMDLs extend to the water bodies which are identified within the Big Raccoon Creek watershed, 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.