Indiana's 303(d) Listing Methodology for Impaired Waterbodies and Total Maximum Daily Load September 2002

Regulatory Background

Section 303(d) of the 1972 Federal Clean Water Act (CWA) requires each state to identify those waters that do not meet the state's water quality standards for designated uses. For these impaired waters, states are required to establish total maximum daily loads (TMDLs) to meet the state water quality standards in accordance with a set schedule and priority ranking. In addition, the U.S. Environmental Protection Agency (EPA) has recently released a guidance document entitled, "2002 Integrated Water Quality Monitoring and Assessment Report Guidance". The guidance recommends that "states, territories, and authorized tribes submit a 2002 Integrated Water Quality Monitoring and Assessment Report…that will satisfy CWA requirements for both Section 305(b) water quality reports and Section 303(d) list" of impaired waters. Indiana will follow this guidance for the 303(d) listing methodology.

Indiana Department of Environmental Management's (IDEM's) Surface Water Quality Monitoring Strategy

The Indiana Department of Environmental Management has developed a surface water quality monitoring strategy to assess the quality of Indiana's ambient waters. The goals of this monitoring strategy are as follows:

1) Measure the physical, chemical, bacteriological and biological quality of the aquatic environment in all river basins and identify factors responsible for impairment
2) Assess the impact of human and other activities on the surface water resource
3) Identify trends through the analysis of environmental data
4) Provide environmental quality assessment to support water quality management programs

To achieve the goals listed above, IDEM has divided the state into five major water management basins. The monitoring strategy calls for rotating through each of these basins once every five years to monitor Indiana's rivers, streams, and lakes under the following data-collection sampling programs:

1) Watershed Monitoring Program
2) Fixed Station Monitoring Program
3) *E. Coli* Monitoring Program
4) Fish Community Monitoring Program
5) Fish Tissue Contaminant Monitoring Program
6) Macroinvertebrate Community Monitoring Program
7) Special Projects

Designated Uses

The Indiana Department of Environmental Management, within the framework of the state's water quality monitoring strategy, monitors and assesses Indiana's surface waters to insure they meet the state water quality standards for designated uses. The water quality standards are designed to insure that all waters of the state, unless specifically exempted, are safe for full body contact recreation and are protective of aquatic life, wildlife, and human health.

Water Quality Assessment Methodology

Use Support/Impairment status is determined for each stream waterbody using the assessment guidelines provided in the USEPA document *Guidelines for Preparation of the State Water Quality Assessments (305[b] Reports) and Electronic Updates: Report Contents*. Washington, DC: U. S. Environmental Protection Agency. (*EPA-841-B-97-002A*.) Available results from six monitoring result types listed below are integrated to provide an assessment for each stream waterbody for 305(b) reporting and 303(d) listing purposes.*

- Physical/chemical water results.
- Fish community assessment.
- Benthic aquatic macroinvertebrate community assessments.
- Fish tissue and surficial aquatic sediment contaminant results.
- Habitat evaluation.
- *E. coli* monitoring results.

Hydrologic Unit Areas

Waterbodies are identified based on watershed areas known as 14- digit hydrologic unit areas (HUAs). These watersheds range from about 5,000 to 20,000 acres in Indiana. The average 14-digit hydrologic unit area in Indiana is about 12,000 acres or 20 square miles. River miles in a 14-diget watershed are designated as one waterbody. These waterbodies may be broken into smaller segments to properly reflect the water quality assessment. Each lake in a watershed is reported as a separate waterbody.

Large rivers with over 1,000 square miles of drainage area are tracked by reach of the mainstem within hydrologic unit areas. This way the wadeable streams and nonwadeable streams are separated so that issues, such as sampling techniques, which might bias results can be considered within a class of streams.

* IDEM staff from the following program areas were involved in the evaluation of Indiana's waterbodies: the TMDL Group, the Environmental Toxicology and Chemistry Section, Biological Studies Section, Water Quality Surveys Section, and Water Quality Standards Section. Staff from other program areas were consulted where appropriate.

Lakes, reservoirs, and wetlands are tracked individually. They are reported with the hydrologic unit area in which they are located whether or not the lake or reservoir is also included as a linear stream feature in the National Hydrography Dataset.

Lake Michigan is tracked both as Great Lake shoreline miles and as a lake with its own USGS cataloging unit (eight-digit hydrologic unit area). The shoreline is assigned mileage units. Lake Michigan as a separate lake waterbody is assigned acreage units. Hopefully, separate tracking will lead to better assessment and understanding of the water quality of the Indiana waters of this lake.

Water quality Assessment Decisions

The water quality assessment process is applied to each data-sampling program. Then the individual assessments are integrated into a comprehensive assessment for each waterbody by use designation: aquatic life support, fish consumption, drinking water supply, and recreational use. Smaller segments are identified for stream reaches as needed when the assessment for a stream reach differed from the default waterbody segment assessment. Each segment in the 305(b) assessment database corresponds to a linear, polygonal, or point feature in the Indiana Reach Index geo-referenced with the National Hydrography Dataset.

Water quality assessments are done by evaluating and coordinating data from site specific chemical (water, sediment and fish tissue), physical (habitat, flow data), and biological (fish community, macroinvertebrates, and *E. coli*) monitoring of Indiana's rivers, streams, and lakes. Chemical data for toxicants [total recoverable or dissolved metals, polynuclear aromatic hydrocarbons (PAHs), pesticides, ammonia, and cyanide], conventional water chemistry parameters (dissolved oxygen, pH, temperature, and anions), and bacteria (*E. coli*) were evaluated for compliance with Indiana's Water Quality Standards (327 IAC 2-1-6 and 327 IAC 2-1.5-8). USEPA 305(b) Guidelines were applied to chemical and biological data as indicated in *Guidelines for Preparation of the State Water Quality Assessments (305[b] Reports) and Electronic Updates: Supplement*. Washington, DC: U. S. Environmental Protection Agency. *EPA-841-B-97-002B.* A complete list of criteria used for use support assessments for aquatic life and human health for the 303(d) listing is provided in Table 1.

Table 1 Criteria for Use Support Assessment for 303(d) Listing

Parameter			
Aquatic Life Use Support			
Toxicants	Metals, pesticides, PAHs, cyanide, ammonia were evaluated on a site by site basis and judged according to the magnitude of the exceedance of water quality standards and the number of times exceedances occurred.		
Conventional inorganics	Dissolved oxygen, pH, total dissolved solids, specific conductance, sulfate, chloride were evaluated for exceedance of water quality standards using USEPA guidelines.		
Nutrients	Presence of some stream response dissolved oxygen, pH, algae, chlorophyll, field observations with corresponding high inorganic and/or organic nutrient parameters combined with possible nutrient source.		
Indiana Trophic State Index (lakes only)	Nutrients, dissolved oxygen, turbidity, algae growth, and sometimes pH were evaluated on a lake-by-lake basis. Each parameter judged according to magnitude.		
Parameter	**Fully Supporting**	**Partially Supporting**	**Not Supporting**
Benthic aquatic macroinvertebrate Index of Biotic Integrity (mIBI)*	mIBI $\geq$ 4.	mIBI < 4 and $\geq$ 2.	mIBI < 2.
Qualitative habitat use evaluation (QHEI)*	QHEI $\geq$ 64.	QHEI < 64 and $\geq$ 51.	QHEI < 51.
Fish community (IBI)* (Lower White River, West Fork)	IBI $\geq$ 44.	IBI < 44 and $\geq$ 22	IBI < 22.
Fish community (IBI)* (White, East Fork; Whitewater; and Upper Wabash basins)	IBI > 34	IBI $\leq$ 34 and $\geq$ 32	IBI < 32
Fish community (IBI)* (Lower Wabash, Upper Illinois, Great Lakes Basin, Ohio River tributaries)	IBI $\geq$ 32		IBI < 32

* Biological impairment classifications for streams were based on the sampling and evaluation of either the fish communities and/or benthic aquatic macroinvertebrate communities. Indices of Biotic Integrity (IBI) for fish and/or macroinvertebrate IBI (mIBI) assessment scores were calculated and compared to regionally calibrated models. In evaluating fish communities, streams rating as "poor" or worse were classified as non-supporting for aquatic life uses. Those rated as "fair" were considered only partially supporting for aquatic life uses. For benthic aquatic macroinvertebrate communities, individual sites were compared to a statewide calibration at the family level of identification for Indiana. All sites at or above background for the calibration were considered to be supporting aquatic life uses. Those sites rated as moderately impaired in the calibration were considered to be partially supporting. Those sites rated as severely impaired in the calibration were considered to be non supporting. Partial and non-support for aquatic life use was considered an impairment of the biological community. Consideration was also given to the size of the stream being assessed. Habitat evaluations were considered in determining the potential for waters to support aquatic communities. If habitat was the primary reason for non-support, then the waterbody was not considered for inclusion on IDEMs 303(d) list (Category 5) of impaired waters (see Category 4C under "Consolidated Listing Methodology").

Table 1 Criteria for Use Support Assessment for 303(d) Listing

Human Health Use Support – Fish Consumption (Fishable)			
Parameter	**Fully Supporting**	**Partially Supporting**	**Not Supporting**
Fish tissue (Contaminants)	Group 1** Unlimited Consumption	Group 2 – 4** Limited Consumption	Group 5** Do Not Eat
** Indiana Fish Consumption Advisory, 1999, includes a state wide advisory for carp consumption. Only site specific fish consumption advisories were considered in determining use support status.			
Parameter	**Fully Supporting**	**Partially Supporting**	**Not Supporting**
Human Health Recreational Use Support (Swimmable)			
Bacteria: at least 5 equally spaced samples over 30 days.	Meets both geometric mean and no more than one sample substantially > single sample maximum	Meets geometric mean. More than one sample substantially > single sample maximum.	Exceeds geometric mean.
Bacteria: grab samples (cfu = colony forming units)	No more than one grab sample (no more than 10% if 10 or more samples) substantially > single sample maximum	More than 10% of samples substantially > single sample maximum. No more than one sample > 10,000 cfu/100ml	More than 25% of samples substantially > single sample maximum or more than one sample > 10,000 cfu/100ml

Note: All streams assessed as "Partially Supporting" or "Not Supporting" were considered for 303(d) listing purposes. Table was modified from Indiana Integrated Water Quality Assessment Report, 2002.

Lake assessments were based on the Indiana Trophic State (or eutrophication) Index, a modified version of the BonHomme Index developed for Indiana lakes in 1972. This multi-metric index combines chemical, physical, and biological data into one overall trophic score for each public lake and reservoir sampled. Scores range from 0 to 75. Lower values reflect lower concentrations of nutrients. This information is useful in evaluating watershed impacts on ~~a~~ lakes. Declining or extirpated Cisco populations and the presence of exotic and potentially toxic blue-green algae species were also considered when evaluating lake water quality. For drinking water reservoirs, taste and odor was also considered as a potential indicator of other water quality problems within the waterbody.

Waterbodies were classified as monitored if surface water quality data used for assessments were no more than five years old, or were still considered representative of current conditions. Fish tissue data and surficial sediment results used for fish consumption advisories may be older than five years. Waterbodies with monitoring site(s) upstream and/or downstream, which were applicable to the waterbody, were classified as monitored. Waterbodies were classified as evaluated if the primary data used for assessment was more than five years old and little was known concerning changes in the watershed, or the assessment was based on other monitored waterbodies in the watershed. Only waterbodies designated as monitored were considered for 303(d) listing purposes.

TMDL Advisory Workgroup

Senate Enrolled Act 431, section 28 directs IDEM to appoint an advisory group consisting of a "working group of stakeholders" to advise IDEM and the Water Board on matters involving the implementation of Total Maximum Daily Load requirements. In response, IDEM established a group representing major stakeholders including, but not limited to, municipalities; soil and water conservation districts; utilities, county health departments; business, agricultural, and environmental interests; other state and federal agencies; and the general public. The group met regularly beginning in October of 2000. As part of this effort a subgroup was formed to focus on the 303(d) listing/delisting methodology. As a result of this work a draft document of recommendations was presented to IDEM. These recommendations have been incorporated into IDEMs listing/delisting methodology for the 2002 303(d) list.

Advisory Group Recommendations

TMDL Advisory Workgroup recommendations concerning Listing and De-listing for the 303(d) list covered several topics such as water quality data, Quality Assurance/Quality Control (QA/QC) of analytical data and use of best professional judgment in evaluating the data for the list. These recommendations include:

- Number of exceedances for water quality standards for Conventional and Non-conventional pollutants. Use Best Professional Judgement if data indicate a real problem.
- Toxicants data, number of exceedances and their relationship with the acute and chronic water quality standards should be considered in making the water quality decisions.
- To collect good quality data, IDEM already has a Quality Assurance Project Plan (QAPP) in place for TMDL and other water quality monitoring projects. Data from external parties must either comply with IDEM QAPP or at least must comply with 40 CFR 136 analysis methodology and its corresponding Quality Assurance. Other data from professionals known by IDEM to have appropriate QA/QC could also be considered adequate for listing/de-listing decisions.
- Follow EPA guidance for contaminants data for Fish Consumption Advisories.
- For biological data, use EPA guidance.
- IDEM staff should apply rational professional discretion. Written justification should be documented for stakeholders to understand how the decision was made.
- Sediment quality in a waterbody should be considered only as a component of best professional judgement. Because there is no approved IDEM metric for sediment quality, it should not stand alone as a reason for listing. However, the presence of a biological impairment related to sediment could be used as a reason for listing.

- Incidental impairments due to extraordinary conditions, floods and short-term spill are not representative of current conditions, should not be used for listing.
- A waterbody impaired solely due to a point source noncompliance with permit limits should not be listed, but addressed through an appropriate regulatory compliance program.
- For de-listing the following conditions could be considered as adequate: the original listing was deemed incorrect, the original impairment has been addressed and the new data provides evidence of supporting the designated use, appropriate new data suggests impairment does not exist any more, a TMDL has been completed, the water quality standard has changed, and the EPA guidance has changed such as for biological listing or use of fish consumption advisories.
- IDEM should develop a listing and de-listing methodology as a policy that external stakeholders can understand.
- The Advisory Workgroup concurs with the IDEM on using the 5- Category list as a consolidated listing methodology as recommended in the EPA's 2002 "Integrated Water Quality Monitoring And Assessment Report Guidance".

Consolidated Listing Methodology

For the development of the 2002 303(d) list, the Indiana Department of Environmental Management (IDEM) has followed, to the degree possible, the 305(b) and 303(d) reporting methods outlined in the United States Environmental Protection Agency's (EPA) 2002 Integrated Water Quality Monitoring and Assessment Report Guidance. This integrated report is designed to satisfy the Clean Water Act (CWA) requirements for both Section 305(b) water quality reports, and Section 303(d) lists. The 303(d) list was developed using the 305(b) Assessment Database.

Interpretation of the data and 303(d) listing decisions take into account IDEM's assessment methodologies for the 305(b) report, EPA guidance, and recommendations outlined by Indiana's TMDL Advisory Group. One aspect of the Integrated Water Quality Monitoring and Assessment Report Guidance calls for a comprehensive listing of all monitored or assessed water bodies in the state according to the state's assessment and listing methodology. Each waterbody is to be placed in one of five categories depending on the degree to which it supports designated uses. Delineation of these waterbodies or assessment units (AUs) will be based on the National Hydrography Dataset (NHD). The NHD is a database created by EPA and the United States Geological Survey that provides a comprehensive coverage of hydrographic data for the United States. It uniquely identifies and interconnects the stream segments that comprise the nations surface water drainage system. It also contains information for other common surface water bodies such as lakes, reservoirs, estuaries, and coastlines. States may use spatial resolution on a finer scale than the NHD, and EPA will translate that resolution into the NHD system. An explanation of the five categories is given below. The actual 303(d) list will consist of AUs listed in category five.

Listing of Waterbody Assessment Units (AUs) by Category:

Category 1 **Attaining the water quality standard and no use is threatened.** Waterbodies (AUs) should be listed in this category if there are data and information that meet the requirements of the state's assessment and listing methodology and support a determination that the water quality standard is attained and no use is threatened.

Category 2 **Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened.** Waterbodies (AUs) should be listed in this category if there are data and information which meet the requirements of the state's assessment and listing methodology to support a determination that some, but not all, uses are attained and none are threatened.

Category 3 **Insufficient or no data and information to determine if any designated use is attained.** Waterbodies (AUs) should be listed in this category where the data or information to support an attainment determination for any use is not available, consistent with the requirements of the state's assessment and listing methodology.

Category 4 **Impaired or threatened for one or more designated uses but does not require the development of a TMDL .**

A. **TMDL has been completed and approved by EPA.** Monitoring should be scheduled for these waterbodies (AUs) to verify that the water quality standard is met when the water quality management actions needed to achieve all TMDLs are implemented.

B. **Other pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future.** Consistent with the regulation under 130.7(b)(i),(ii), and (iii), waterbodies (AUs) should be listed in this subcategory where other pollution control requirements required by local, state, or federal authority are stringent enough to achieve any water quality standard (WQS) applicable to such waters. Monitoring should be scheduled for these AUs to verify that the water quality standard is attained as expected.

C. **Impairment is not caused by a pollutant**. Waterbodies (AUs) should be listed in this subcategory if the impairment is not caused by a pollutant.

Category 5 **The water quality standard is not attained. The waterbody (AU) is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL**. <u>This category constitutes the Section 303(d) list of waters impaired or threatened by a pollutant(s) for which one or more TMDL(s) are needed.</u> An AU should be listed in this category if it is determined, in accordance with the state's assessment and listing methodology, that a pollutant has caused, is suspected of causing, or is projected to cause an impairment. Where more than one pollutant is associated with the impairment of a single AU, the AU will remain in Category 5 until TMDLs for all pollutants have been completed and approved by EPA.

Because each situation is unique, resources, and data sets are sometimes limited, the 2002 listing process may at times require IDEM staff to apply rational professional discretion. Any waterbody assessed differently than indicated in the water quality assessment methodology outlined above will be accompanied by written justification, so that stakeholders will understand how each decision was made.

The 2002 303(d) list includes impaired waterbodies from the 1998 303(d) list that still require TMDL development. For a stream to be listed, it must have been monitored, and the data support listing. Any data, both internal or from outside sources, that is used for listing decisions must meet IDEMs quality assurance and quality control (QA/QC) requirements as outlined in IDEMs TMDL and surface water quality monitoring Quality Assurance Project Plan.

De-listing of Waterbodies

The US EPA's new guidance does not change existing rules for listing and de-listing. The existing regulations require states, at the request of the EPA's Regional Administrator, to demonstrate good cause for not including waterbodies on the 303(d) list that were included on previous 303(d) lists (pursuant to 40 C.F.R. 130.7(b)(6)(iv)). In general IDEM will only consider delisting a waterbody if one of the following is true:

1) New data indicates that water quality standards are now being met for the waterbody under consideration
2) The listing methodology has changed, and the waterbody under consideration would not be considered impaired under the new methodology
3) A change has been made to the states water quality standards which would indicate that a listed waterbody is now considered supporting of designated uses
4) An error is discovered in either the sampling, testing, or reporting of data that led to an inappropriate listing
5) If it is determined that another program, besides the TMDL program, is better suited to address the water quality problem, or the problem is determined not to be caused by a pollutant (see category 4B and 4C above).
6) A TMDL has been completed, and the waterbody is expected to meet water quality standards after implementation of the TMDL (see category 4A above).

TMDL Development Schedule and Prioritization

The TMDL development schedule corresponds with IDEM's basin-rotation water quality monitoring schedule. To take advantage of all available resources for TMDL development, waters on the 303(d) list (Category 5) will be scheduled for TMDL development according to the basin-rotation schedule unless there is a significant reason to deviate from this schedule. Waterbodies will also be scheduled based on the following:

1) Waterbodies may be given a high or low priority for TMDL development depending on the specific designated uses that are not being met, or in relation to the magnitude of the impairment.
2) TMDL development of waterbodies where other interested parties, such as local watershed groups, are working on alleviating the water quality problem may be delayed to give these other actions time to have a positive impact on the waterbody. If water quality standards still are not met, then the TMDL process will be initiated.
3) TMDLs that are required due to water quality violations relating to pollutant parameters where no EPA guidance is available, may be delayed to give EPA time to develop guidance.

Waterbodies on the 2002 303(d) list have been scheduled for TMDL development over 15 years (2002 – 2016). Since the Clean Water Act does not clearly define the timeline for TMDL development, EPA, in response to the Federal Advisory Committee Act (FACA) Committee's recommendations, issued guidance for States to develop expeditious schedules of not more than 8 – 15 years. 40 CFR section 130.7 also dictates that the 303(d) list specifically include the identification of waters targeted for TMDL development in the next 2 years.

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