

ATTACHMENT 2

Draft Assessment Methodology for the Assessment of Waters Designated for Public Water-Supply

Unlike most other designated uses, which apply to all waters of the state, the public water- supply use is very narrowly defined in Indiana’s water quality standards (WQS). The water quality criteria specific to public water supply (PWS) were established to protect the surface water quality at the intake – the point at which the water is withdrawn for treatment.

IDEM’s previous and current methodology designates any waterbody with an active¹ surface water intake as a source water for the purposes of making CWA 305(b) assessments and 303(d) listing decisions. However, the revision to the methodology expands the definition of a source water to include surface waters with intakes for emergency water supplies and those waters that have been determined to have a direct influence on a PWS well. Although intakes for emergency water supplies are not regularly used for source water, they may be placed into service if needed and thus should carry the same designation as other source waters.

IDEM has also identified five PWS systems that are under the direct influence of surface waters. Although some mitigation may occur through infiltration of the surface water through the soil layer, IDEM has chosen to designate these waters as source waters based on their potential ability to carry any contaminants into the PWS. If and when IDEM identifies additional surface waters with the potential to directly influence a PWS well, they will be designated for the PWS use and assessed in the manner described in this methodology.

Changes to Indiana’s Reach Index to Support Water Quality Assessments of Waters Designated for PWS

Many of the waters currently designated as source waters for PWS and those to be newly designated as such will need to be reindexed to support the new water quality assessment methods described in this document. This is because Indiana’s Reach Index, which allows mapping of Indiana’s streams as linear features and its lakes as polygons, does not allow for the mapping of individual points. As presently indexed, any waterbody with a surface water intake is designated as a source water for PWS regardless of its size, leading to over-extrapolation of data during the assessment process.

In order to determine source water quality at the intake, IDEM must define new, smaller assessment units. Any stream on which an intake is located will be reindexed. IDEM will not reindex inland lakes or Lake Michigan but will reindex the Lake Michigan shoreline in order to apply its revised assessment methodology.

Inland Lakes and Streams

For inland lakes and streams, IDEM’s methods for defining assessment units for PWS are based on the approach described in Indiana’s Source Water Assessment Plan (SWAP) for developing source water assessments (SWAs), required under the federal Safe Drinking Water Act (SDWA), for PWSs that rely on surface water as part or all of their supply. This approach includes an evaluation of susceptibility, which is the potential for a PWS intake to draw in

¹ “Active” intakes are those that are currently in use. “Inactive” intakes are those that were previously in service but taken offline by the treatment facility and which are unlikely to ever be re-activated.

surface water with contaminant concentrations that would cause concern for water-utility operators or the consumer (IDEM, 2000).

According to the SWAP, susceptibility may be represented as a series of “zones” for the purposes of developing contingency plans and to prepare for emergency response. The zones in which contamination has the potential to create a water-supply emergency or have otherwise adverse effects within a matter of hours or days are those in close proximity to the intake.

While these zones are not intended to support water quality assessments for the purposes of CWA 305(b) assessments, their use for assessments is in keeping with the water quality criteria in Indiana’s WQS, which were “established to protect the surface water quality at the point at which water is withdrawn for treatment for public supply.”

Inland lakes and reservoirs are treated as individual assessment units for the purposes of PWS assessments, regardless of where in the waterbody the intake is located. This is consistent with Indiana’s SWAP, in which susceptibility zones are defined around the entire perimeter of the lake. This approach assumes that contaminants introduced anywhere in the lake have the potential to impact the quality of the water withdrawn at the intake, and therefore provides a representative unit of assessment for the purposes of determining designated use support.

For all streams, including the Ohio River, IDEM has defined assessment units (AUs) for each intake based on the “Emergency Management Zone”, which begins at the point of surface water withdrawal at the intake to 1,000 feet upstream. The AUs in the Indiana Reach Index on which surface water intakes are located are currently much larger than 1,000 feet and will need to be reindexed to accommodate these more narrowly- applied assessments.

Lake Michigan

IDEM’s PWS use assessments for Lake Michigan will apply only to the areas in which source waters are withdrawn within Indiana’s state boundary. For the purposes of determining support of PWS use in Lake Michigan, IDEM has defined its AUs based on the “Immediate Nearshore Area” (INA) as defined in Indiana’s SWAP. The INA is all the land within 1,000 feet of the shoreline, extending 0.5 mile on either side of where the intake pipe intersects the shoreline area. This is the area that has the greatest potential for contaminants coming from the shoreline to have adverse effects on the PWS within a matter of hours or days.

The lateral distance of each AU will be limited to the INA. The distance out into the lake will extend to the Indiana border, which lies entirely within the nearshore waters of Lake Michigan².

Surface Waters with a Direct Influence on a PWS Well

To date, IDEM has identified five PWS systems using ground water as their primary source of drinking water with one or more wells that have been determined to be under the direct influence of surface water. All of these systems are community PWS systems, which are public water systems that provide water for human consumption to at least 15 service connections used

² In its Great Lakes Monitoring and Research Strategy, U.S. EPA defines the boundary between offshore and nearshore areas as the depth contour equal to the mean depth of the lake. The nearshore area consists of water adjacent to the shoreline and no more than 85 meters in depth. Based on the delineation provided in the strategy, the entire Indiana portion of Lake Michigan lies within the nearshore area (U.S. EPA, 1992).

by year-round residents, or which regularly serve at least 25 year-round residents (e.g. municipalities, subdivisions, and mobile home parks). IDEM expects to identify additional public water systems in the future that are under the direct influence of surface water which, in addition to community water systems, could include other systems such as non-transient non-community water systems. Non-transient, non-community water systems are public water systems that serve at least 25 of the same people more than six months per year (e.g., schools, factories, industrial parks, office buildings).

For any public water system well under the direct influence of surface waters, it is possible that pollutants in surface waters located within the well field can reach the well through infiltration, through absorption into the soil, or through conduits such as field tiles or water distribution piping that intercepts sandy soils. Specific sources of contaminants vary based on location but can include agricultural chemicals and nonpoint source runoff from roads and highways.

The geographic extent of surface water influence has been modeled in the Wellhead Protection Plans for those community PWS systems with areas known to be susceptible to surface water. For the purposes of use support assessments, any surface water within the modeled area of influence will be designated as a PWS.

Non-transient, non-community public water systems are not required to complete a Wellhead Protection Plan. IDEM has provided each non-transient, non-community public water system well found to be under the direct influence of surface water Source Water Assessment specific to their drinking water well location(s) and which define a 3,000-foot radius of concern around the well. For the purposes of use support assessments, any surface water within the 3,000-foot radius of concern will be designated as a PWS.

Water Quality Indicators for Determining Support of PWS Use

Indicators used in the assessment of drinking water use support include the following:

- Any substances for which numeric criteria for human health apply at the point of water intake that have been identified in Tables 6-1 and 8-3 of Indiana's Water Quality Standards.³
- Any substances for which numeric criteria are defined specifically for the PWS use⁴ with the exception of total coliform bacteria for which Level 1 and Level 2 Assessments under the federal SDWA Revised Total Coliform Rule (RTCR) are used.
- The cyanobacterial toxins Cylindrospermopsin and Microcystin-LR for which U.S. EPA has issued drinking water health advisory values.

³ The criteria identified in Table 6-1 are applicable to waters outside the Great Lakes basin and can be found in 327 IAC 2-1-6. The criteria identified in Table 8-3 apply to waters located within the Great Lakes basin and can be found in 327 IAC 2-1.5-8.

⁴ For all waters in the Great lakes basin, these substances and criteria are defined in 327 IAC 2-1.5-8(f). For all other Indiana waters, these substances and criteria are defined in 327 IAC 2-1-6(e).

Water Quality Criteria and Other Benchmarks for Determining Support of PWS Use

Human Health Criteria Applicable at the Point of Intake and Other Water Quality Criteria Specific to the PWS Use

Indiana's WQS contain human health criteria for several substances applicable at the point of intake in order to protect the public from negative health effects that could occur if they are found in high concentrations in source waters.

For waters in the Great Lakes basin, IDEM will apply the most stringent of the Human Non-cancer Criterion (HNC), or the Human Cancer Criterion (HCC) defined for drinking water in Table 8-3 of Indiana's WQS.

For waters outside the Great Lakes basin, IDEM will apply the continuous criterion concentration (CCC) values shown in Table 6-1 of Indiana's WQS at the point of water intake, which represents the most stringent human health criterion for a given substance and is thus the most protective of the PWS use.

Indiana's WQS contain numeric criteria specifically for waters designated as source waters for PWS, which, like human health criteria, are applicable at the point of intake⁵. The WQS also include the following criteria to prevent taste and odor issues and to protect human health:

- Chloride. (250 mg/l)
- Sulfate. (250 mg/l)
- Dissolved solids.(750 mg/l) (or 1,200 micromhos specific conductance as a surrogate)
- Nitrite. (1 mg/l)
- Nitrogen, measured as the sum of nitrate and nitrite. (10 mg/l)

The criteria for chloride, sulfate, and dissolved solids are intended to prevent taste and odor issues. The criteria for nitrite and nitrogen are intended to protect human health.

IDEM will apply these criteria to data sets meeting the minimum data requirements identified in Table 2 and which were collected from waters designated for PWS in accordance with this methodology.

Indiana's WQS also contain numeric criteria for total coliform bacteria for waters designated as source waters for PWS and which are also applicable at the point of intake⁶. However, because exceedances of these criteria in source waters do not prohibit or otherwise limit the use of those waters for PWS, IDEM instead bases its assessment methodology for bacteria in source waters on the federal SDWA RTCR. The RTCR went into effect in Indiana on April 1, 2016, replacing the Total Coliform Rule which had been in effect since 1989. Under the previous rule, there was no systematic way to determine when MCL violations for bacteria were attributable to source water issues, whereas the RTCR does. Because the RTCR provides a means of identifying PWSs adversely impacted by bacterial contamination in source waters, it provides greater opportunities for their protection through IDEM's CWA programs.

The RTCR is intended primarily to protect the integrity of the drinking water distribution

⁵ For waters in the Great lakes basin, these substances and criteria are defined in 327 IAC 2-1.5-8(f). For all other Indiana waters, these substances and criteria are defined in 327 IAC 2-1-6(e). ⁶ See footnote 1.

⁶ See footnote 1.

system. However, the Level 1 and Level 2 Assessments, which are required in cases where bacteria are detected in treated water, requires an examination of source waters in addition to the investigation of other factors⁷. Therefore, the results of Level 1 and 2 assessments conducted under the RTCR will reveal those situations in which MCL violations for bacteria are attributable to source water contamination, as opposed to issues within the plant and/or its distribution system.

Although all PWS are required to sample for bacteria, bacterial contamination in source water is primarily a concern for facilities that draw their supplies from surface water, which is vulnerable to far more sources of fecal contamination than ground water. PWS wells under the direct influence of surface water are also somewhat vulnerable to bacterial contamination. However, bacteria can be effectively removed with conventional PWS treatment; specifically, the disinfection portion of the treatment process, which is required for all surface water systems. Therefore, it is rarely the case that MCL violations for bacteria in treated water are the result of excessive bacterial concentrations in source water⁸.

By using RTCR assessment results instead of applying a numeric criterion, IDEM's PWS methodology balances the possibility that bacterial contamination in a source water might impair its designated use (i.e. prohibit or otherwise limit its use for PWS) with the greater likelihood that MCL violations for bacteria (indicators of potential impairment) are attributable solely to issues within the plant or its distribution system, or both. Using the RTCR ensures that IDEM's assessments will achieve the following:

- Identify those rare cases in which bacterial contamination in source water is limiting or prohibiting the use of an otherwise treatable supply or driving a need for additional types of treatment above and beyond conventional methods.
- Do not assess as impaired source waters based on MCL violations attributable to problems within the facility or its distribution system, or both – issues for which other regulatory means already exist to remedy under the SDWA.

Benchmarks Used to Assess for Cyanobacterial Toxins

Algae are a common component of aquatic ecosystems, and are commonly found in Indiana lakes and streams. However, the concentrated presence of blue-green algae (cyanobacteria) can be linked to some adverse health effects and as a result, cyanobacterial toxins are a growing concern for drinking water facilities. It should be noted here that not all blue-green algal blooms produce toxins, and the specific conditions that lead to cyanobacterial toxin production are not well understood in the scientific community.

The SDWA requires water treatment facilities to notify the public when they detect a health risk in treated drinking water supplies. IDEM considers any consumption and use notification issued by a water treatment facility based on cyanobacterial toxin concentrations in treated drinking water to be indicative of source water impairment.

Currently, there are no U.S. Federal water quality numeric criteria or regulations for cyanobacteria or cyanobacterial toxins in drinking water under the SDWA, or for ambient waters

⁷ See <http://in.gov/idem/cleanwater/2494.htm> for more detailed information regarding Level 1 and Level 2 Assessments under the RTCR.

⁸ Personal communication with Stacy Jones, Technical Environmental Specialist for IDEM OWQ's Drinking Water Branch (January 15, 2016).

under the CWA. Indiana's WQS likewise contain no numeric criteria for these substances. However, they do contain narrative criteria intended to protect surface water quality, including those waters designated as a PWS. These criteria state that all Indiana surface waters shall be "free from 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..."⁹

In the absence of state or federal numeric criteria for cyanobacteria or cyanobacterial toxins, IDEM considers the following benchmarks provided in U.S. EPA's drinking water 10-day health advisories defensible for use in assessments based on Indiana's narrative water quality criteria:

- Cylindrospermopsin concentrations greater than 3.0 micrograms per liter.
- Total microcystin concentrations greater than 1.6 micrograms per liter (using microcystin-LR, one of the most potent forms of the toxin, as a surrogate).

Cyanobacterial blooms are seasonal in nature with most occurring in late summer. However, high concentrations of cyanobacterial toxins have been found to occur even in colder months. Therefore, IDEM applies these benchmarks to data collected any time of the year. The occurrence of cyanobacterial toxins in treated drinking water depends on their levels in the raw source water, and the effectiveness of treatment methods for removing cyanobacteria and cyanobacterial toxins during the treatment process.

U.S. EPA's Health Advisory values were developed to protect the public from exposure to cyanobacterial toxins in treated drinking water, not source waters. Given this, using these values as benchmarks for the assessment of untreated source waters is conservative in nature, and based on the idea that if source waters meet these benchmarks, drinking water treatment plants can be reasonably confident that their treatment processes will result in concentrations that are below those that might result in adverse health effects.

However, IDEM's CWA 305(b) and 303(d) assessment and listing processes should not be construed as a public health advisory because they do not reflect conditions in real time. U.S. EPA's health advisories for cyanobacterial toxins are intended to guide treatment decisions when the risk of cyanobacterial toxin contamination is high.

It is important to emphasize that the public cannot assume that because a particular waterbody appears on the 303(d) list for a cyanobacterial toxin impairment, the treated water they draw from the tap is in any way unsafe to drink. The 303(d) list identifies waterbodies that are not fully supporting their designated uses, but is not intended to provide the public with information regarding the quality of the treated drinking water they get from PWSs.

⁹ 327 IAC 2-1-6 (a)(2) and 327 IAC 2-1.5-8(b)(2).

While mindful of the differences in purpose and function of U.S. EPA's health advisories and CWA requirements to determine the degree to which our surface water resources are supporting their use as a PWS, IDEM believes that applying U.S. EPA's Health Advisory numbers as benchmarks provides for greater protection of source waters. Many of the same practices that can help to control taste and odor issues, which are often driven by nutrient enrichment, can also help to reduce the occurrence of algal blooms in surface waters. Where sufficient data are available, applying these benchmarks will help to identify those source waters that are more susceptible to cyanobacterial toxins and prioritize them for further evaluation for CWA Sections 303(d) and 305(b) purposes.

Minimum Data Requirements for Assessment

The PWS use is unlike other designated uses in that it is very narrowly defined in Indiana's WQS. Given the limited size of the AUs defined and designated for PWS, it is unlikely that IDEM will find a significant amount of existing data in its own database to use for assessments with this methodology.

It is anticipated that in the short-term, assessments in accordance with this methodology will rely almost entirely on water quality data collected by PWS facilities. Most of the data that facilities collect are compliance data, which come from the analysis of "finished" or treated water, not untreated source water. There is no requirement under the SDWA for facilities to monitor their intake water, and currently few PWS facilities collect raw water quality data at their intakes. However, through the implementation of its External Data Framework, IDEM hopes to build collaborative partnerships with drinking water facilities and other interested parties to collect the high quality data needed to support assessments going forward. IDEM will also explore the feasibility of expanding its own monitoring program to provide water quality data for assessment and continues to seek additional sources of existing data at or near surface water intakes.

All available water quality data meeting IDEM's data quality requirements, whether collected by IDEM or external parties, will be used for assessment. U.S. EPA guidance suggests that, while all readily available data should be reviewed, 305(b) assessment decisions should be based on data five years old or less. For bacteria, all Level 1 and Level 2 Assessments performed in accordance with the RTCR within the most recent five consecutive years will be considered valid for the purposes of designated use assessments of PWS.

Table 1 provides minimum data requirements for assessments of PWS use support, along with any corresponding requirements regarding timing and frequency of data collection activities.

Table 1: Minimum data requirements for the CWA 305(b) assessments of PWS use support.

Parameter Type	Minimum Information Required for Assessment	Index Period
Drinking Water Use Support – All Waters		
Chemical Toxicants	Minimum of three measurements collected within the same year at least one month apart	Most recent five consecutive years
Cyanobacterial Toxins	Minimum of one measurement	Most recent five consecutive years
	Or One consumption and use notification issued by a water treatment facility based on cyanobacterial toxin concentrations in treated drinking water	
Conventional Inorganics	Minimum of three measurements collected within the same year at least one month apart	Most recent five consecutive years
Bacteria	All Level 1 and/or Level 2 assessments performed in accordance with the RTCR	Most recent five consecutive years

For each AU with sufficient data to make one or more designated use assessments, IDEM applies the 305(b) assessment process described in Table 2. The specific criteria or benchmarks to be applied to the data will depend, in some cases, on the location of the waterbody from which they were collected. Assessment data are integrated for the purposes of making water quality assessments, meaning that all data for a given waterbody are considered together, and each type of data are treated as independently applicable.

Table 2: Water quality assessment methodology for determining PWS use support.

Drinking Water Use Support – All Waters		
<p>The following waters are designated for PWS:</p> <ul style="list-style-type: none"> Streams with active PWS intakes (including the Ohio River) Streams with emergency water-supply intakes that draw from reservoirs Inland Lakes with active PWS intakes or intakes for emergency water-supplies Certain sections of the Lake Michigan shoreline Surface waters with a direct influence on a PWS well <p>When IDEM has data for a waterbody designated for PWS, those data will be compared to the applicable water quality criteria in Indiana’s WQS and other benchmarks identified in this methodology to determine if the drinking water use is supported.</p>		
Chemical Toxicants	Total metals, total cyanide, pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and other organic contaminants were evaluated on a site by site basis and judged according to magnitude of the exceedance(s) of Indiana’s WQS for point of water intake and the number of times exceedance(s) occurred. For any one pollutant (grab or composite samples), the following assessment criteria are applied. “Raw” water is untreated surface water collected from the waterbody of interest.	
	Fully Supporting	Not Supporting

Drinking Water Use Support – All Waters		
	<p>For waters in the Great Lakes basin: Not more than one exceedance in raw water of the human noncancer criterion (HNC) or the human cancer criterion (HCC), whichever is more stringent, within a three-year period</p> <p>For downstate waters: Not more than one exceedance in raw water of the continuous criterion concentration (CCC) at the point of water intake within a three year period</p>	<p>For waters in the Great Lakes basin: More than one exceedance in raw water of the human noncancer criterion (HNC) or the human cancer criterion (HCC), whichever is more stringent, within a three -year period</p> <p>For downstate waters: More than one exceedance in raw water of the continuous criterion concentration (CCC) at the point of water intake within a three -year period</p>
	Fully Supporting	Not Supporting
Cyanobacterial Toxins	<p>Not more than one exceedance in raw water of 3.0 micrograms per liter for Cylindrospermopsin or 1.6 micrograms per liter of total microcystin (using mycrocystin-LR as a surrogate) at the point of water intake within a three -year period</p> <p style="text-align: center;">And</p> <p>No more than one consumption and use notification issued by a water treatment facility during the five -year index period for the assessment based on cyanobacterial toxin concentrations</p>	<p>More than one exceedance in raw water of 3.0 micrograms per liter for Cylindrospermopsin or 1.6 micrograms per liter of total microcystin (using mycrocystin-LR as a surrogate) at the point of water intake within a three-year period</p> <p style="text-align: center;">Or</p> <p>More than one consumption and use notification issued by a water treatment facility during the five-year index period for the assessment based on cyanobacterial toxin concentrations</p>
Conventional Inorganics	<p>Dissolved solids (or specific conductance as a surrogate), sulfate, chloride, nitrite-N and nitrogen (measured as NO₃ + NO₂) were evaluated for the exceedance(s) of Indiana's WQS for point of water intake and the number of times the exceedance(s) occurred. For any single pollutant (grab or composite samples), the following assessment criteria are applied to data sets consisting of three or more measurements. "Raw" water is untreated surface water collected from the waterbody of interest.</p>	
	Fully Supporting	Not Supporting
	Not more than 10% of sample results exceed the applicable criteria or benchmark in raw water	More than 10% of sample results exceed the applicable criteria or benchmark in raw water
Bacteria	Fully Supporting	Not Supporting
	No Level 1 or Level 2 assessment conducted in accordance with the RTCR indicating bacteria violations wholly or partly attributable to source water	One or more Level 1 or Level 2 assessments conducted in accordance with the RTCR indicating bacteria violations wholly or partly attributable to source water

References

- Indiana Department of Environmental Management. 2000. *Indiana's Source Water Assessment Plan*. Indianapolis, Indiana: Indiana Department of Environmental Management. 159 pp. <http://in.gov/idem/cleanwater/2368.htm>
- U.S. Environmental Protection Agency. 2013. *National Primary Drinking Water Regulations: Revisions to the Total Coliform Rule; Final Rule*. 40 CFR Parts 141 and 142: <https://www.gpo.gov/fdsys/pkg/FR-2013-02-13/pdf/2012-31205.pdf>
- U.S. Environmental Protection Agency. 2015a. *Drinking Water Health Advisory for the Cyanobacterial Microcystin Toxins*. U.S. Environmental Protection Agency, Office of Water, Health and Ecological Criteria Division: Washington, D. C. 67 pp. EPA-820R15100.
- U.S. Environmental Protection Agency. 2015b. *Drinking Water Health Advisory for the Cyanobacterial Toxin Cylindrospermopsin*. U.S. Environmental Protection Agency, Office of Water, Health and Ecological Criteria Division: Washington, D. C. 44 pp. EPA-820R15101.
- U.S. Environmental Protection Agency. 1992. *Great Lakes Monitoring and Research Strategy*. U.S. Environmental Protection Agency, Office of Research and Development: Washington, D. C. 218 pp. EPA/620/R-92/001. <http://nepis.epa.gov/>