

# **State of Delaware Draft 2016 Assessment, Listing and Reporting Methodologies Pursuant to Sections 303(d) and 305(b) of the Clean Water Act**

## **General Provisions**

**Data Considered:** All readily available data and information for the period of January 1, 2010 through December 31, 2014 will be considered for the assessment of most designated uses. Given that adequate water quality data may not be available in all cases, determinations of use attainment will be made with an abundance of caution.

## **Data Quality and Quantity**

Data from the Department of Natural Resources and Environmental Control's (DNREC's) Environmental Laboratory Section (ELS) will be considered for use if it is collected and analyzed in accordance with the DNREC ELS Quality Assurance Project Plan. For data from sources other than the DNREC ELS, the Department will consider the quality controls used in collection and analysis to determine if it will be appropriate for use in this assessment. Data will be considered readily available if it is in an electronic format that can be imported into or exported from a modern spreadsheet or database program like Microsoft Excel or Access. Data that is only available on paper will be considered on a case by case basis given the limited resources available to the Department to convert such data to the more usable electronic format.

The Department routinely currently collects water quality samples at more than 100 stations throughout the State. That data makes up the bulk of the data available for use in 305(b) assessments. The Department considers data from the most recent five-year period, thus, at each station, there are usually data from 20 sampling dates or more. Some stations are in place for a more limited time period and have smaller data sets. Other readily available data and reports are requested in advance of each assessment from parties outside of the Department and used when they are made available. In addition to electronic mail requests from specific organizations, a notice will be published in the Delaware State News and the News Journal.

For the 2016 assessment, the Department will consider data and information received on or before November 13, 2015 from the following sources:

- Reports of ambient water quality data including State ambient water quality monitoring programs, citizen volunteer monitoring programs, complaint investigations, and other readily available data sources (e.g., EPA's Storage and Retrieval System (STORET), the United States Geological Survey, and research reports), and data and information provided by the public;
- Reports prepared to satisfy Clean Water Act (CWA) Sections 305(b), 303(d) and 314 and any updates;
- Fish and shellfish advisories
- Restrictions on water sports or recreational contact

## **Coordination with Delaware River Basin Commission (DRBC) and Chesapeake Bay Program Assessments**

The DRBC prepares 305(b) assessment reports every two years for the Delaware River and Delaware Bay. Delaware will incorporate the most recent use attainment determinations made by DRBC for the shared waters of the Delaware River and Delaware Bay into its 2016 303(d) list. Delaware expects to work cooperatively with the DRBC, member states and stakeholders to develop and implement TMDLs in waters of the Delaware River and Bay that the DRBC determines to be impaired.

The Chesapeake Bay Program (CBP) is doing assessments for waters in the Chesapeake Bay and nearby waters that drain into the bay in co-operation with Maryland, Virginia, Washington D.C. and Delaware. Delaware will incorporate the most recent use attainment determinations for waters of the state that use criteria developed by the CBP for waters that drain to the Chesapeake Bay.

## **Use of Environmental Protection Agency Integrated Assessment Guidance**

On July 29, 2005, the EPA published “Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act.” The guidance is available on the internet at this URL: <http://www.epa.gov/owow/tmdl/2006IRG/index.html>. The Guidance was reaffirmed in for the 2008 listing process in a memo by Diane Regas of the EPA. That memo is online at this URL: [http://www.epa.gov/owow/tmdl/2008\\_ir\\_memorandum.html](http://www.epa.gov/owow/tmdl/2008_ir_memorandum.html) . The Guidance was reaffirmed and expanded upon in a May 5, 2009 memorandum posted online at this URL: <http://www.epa.gov/owow/tmdl/guidance/final52009.html> . No significant changes were made to the guidance in the August 13, 2015 memo online here: [http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/2016-IR-Memo-and-Cover-Memo-8\\_13\\_2015.pdf](http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/upload/2016-IR-Memo-and-Cover-Memo-8_13_2015.pdf).

The core recommendation of the guidance is to categorize all waters of the state according to the following five categories:

Category 1: All designated uses are met;

Category 2: Some of the designated uses are met but there is insufficient data to determine if remaining designated uses are met;

Category 3: Insufficient data to determine whether any designated uses are met. Either no data is available or some data is available, but it is insufficient to make a determination

Category 4: Water is impaired or threatened but a TMDL is not needed;

- 4A: All TMDLs for this segment have been completed and EPA approved. Class 4A waters have all necessary TMDLs approved, but one or more impairments exist, despite the approved TMDLs.
- 4B: Other required control measures are expected to result in the attainment of WQSS in a reasonable period of time
- 4C: The impairment or threat is not caused by a pollutant

Category 5: Water is impaired or threatened and a TMDL is needed for at least one pollutant or stressor

Each of Delaware's waterbody segments will be assigned to the appropriate category for each designated use and then 'rolled up' into a final categorization for the segment. For the final categorization, the highest category number from the applicable use determinations will be assigned to each segment. For example, if a hypothetical segment has a Category 1 determination for aquatic life use support based on average dissolved oxygen, a Category 3 determination for primary contact use, and a Category 5 determination for aquatic life use support based on the dissolved oxygen minimum criteria, then the segment would be given an overall categorization of category 5. In this case, DNREC would pursue the collection of additional enterococcus data in order to assess the primary contact use and establish a schedule for developing a TMDL in order to meet the minimum dissolved oxygen criteria.

### **Dissolved Oxygen (DO) Aquatic Life Use Support (ALUS)**

The following types of DO data are potentially available for analysis:

- Field measurements taken by personnel using handheld DO probes; and
- Continuous monitoring data collected using multiparameter monitoring systems that are typically deployed for several days, weeks, or months. In order to get a more accurate picture of dissolved oxygen dynamics and other water quality parameters, the Department continues to increase its use of continuous monitoring systems.

To determine ALUS with regard to Dissolved Oxygen (DO), the following methodology will be used to compare measured DO concentrations to two different standards, the minimum at all times and daily average concentrations. Average DO concentrations are considered to be met if the 10<sup>th</sup> percentile of available data is above the applicable criteria of 5.0 mg/l for marine waters and 5.5 mg/l for fresh waters. The statewide minimum DO concentration for surface waters is 4.0 mg/l at any time. Stations are judged to be in compliance with this criterion if the minimum is not violated by more than 1% of continuous monitoring data and no more than two field samples are below the minimum.

#### **Assessments of Average DO Criteria Attainment:**

If sampling events occurred on at least ten different days during the assessment period for each station, attainment of the DO average criteria will be assessed using the method that follows. Stations with fewer than ten different sampling days will be considered to have insufficient data and be placed in Category 3 for this assessment cycle. Stations where monitoring has been discontinued that have data from fewer than 10 days will not be considered for further evaluation.

For purposes of DO compliance with the daily average criteria in a segment, continuous monitoring data, if available, will be averaged on a daily basis for each station. If no continuous data is available, then the field measurements (as available) will be considered to be representative of the daily average for that day. Any type of sample (continuous or field measurement) will be considered to be representative for that station at the time of collection. Once the daily average for each station (station daily average, SDA) has been determined, the SDAs for each station will be pooled and the upper confidence limit (UCL) of the nonparametric 10<sup>th</sup> percentile confidence interval will be determined using methods described in Section 3.7 of Helsel and Hirsch . That UCL will be compared to the applicable standard. If the UCL is above

the applicable average criteria for all stations in a segment, the segment will be considered to be fully supporting (Category 1) for the DO average portion of ALUS. If the UCL from any station in a segment is below the applicable average, the segment will be considered not fully supportive of the aquatic life use (Category 5)

Formally stated, the following hypotheses will be tested:

$H_0$ : at the 90% Confidence level,  $X_{10} \geq \text{Standard}$

$H_1$ : at the 90% Confidence level,  $X_{10} < \text{Standard}$

Where  $X_{10}$ = Non parametric estimate of the 10th percentile of available data.

#### **Assessments of Minimum DO Criteria Attainment:**

Attainment of the minimum DO criteria will be assessed based on all available data (note that ten samples in 5 years are not needed for the comparison to the minimum). For stations for which no continuous DO monitoring data are available, two or more SDAs in five years below the applicable minimum will be sufficient evidence to show that the aquatic life use is not supported (Category 5).

For stations with continuous monitoring data, available continuous monitoring data will be pooled on an annual basis for each station. The UCL of the first percentile of the data will be calculated and compared to the minimum criteria in the same manner as the average comparison above for each year of the applicable five previous years. One or more years in which the upper confidence limit of the first percentile is below the minimum will be sufficient to determine that aquatic life use is not fully supported in the segment (Category 5). See the flow chart below for a graphical depiction of the dissolved oxygen assessment process.

## Nutrient Enrichment Assessment

From a state-wide perspective, nutrient overenrichment is one of the leading causes of water quality impairment in Delaware. While nutrients are essential to the health of aquatic ecosystems, excessive nutrient loadings to surface waters can lead to an undesirable proliferation of aquatic weeds and algae, which in turn can result in oxygen depletion and associated impacts to fish and macroinvertebrate populations. Excessive aquatic plant growth can also preclude or seriously curtail water dependent activities such as fishing and boating when plant densities become so great that uses are not physically possible.

For tidal portions of the Indian River, Rehoboth Bay and Little Assawoman Bay watersheds, the water quality criterion for dissolved inorganic nitrogen is a seasonal average of 0.14 mg/l as N, and for dissolved inorganic phosphorus a seasonal average of 0.01 mg/l. For those stations where sampling events occurred on at least ten different days during the assessment period, the available data for the months of March to October from each station will be averaged and confidence intervals on the averages will be determined. The lower confidence limit on the averages will be compared to the above values to assess attainment of desired nutrient levels in these waters. Stations with fewer than ten different sampling days will be considered to have insufficient data and be placed in Category 3 for this assessment cycle. Segments with one or more stations whose lower confidence limit on their seasonal average is above the criteria will be considered to be not fully supporting the aquatic life use (Category 5).

For the remaining waters of the State, the Department has been developing and implementing nutrient and dissolved oxygen TMDLs using target values for total nitrogen of 2-3 mg/l and total phosphorus levels of 0.1 to 0.2 mg/l. These target values were developed in order to implement the narrative provisions in the Surface Water Quality Standards. For those stations with sampling events on at least ten different days during the five-year assessment period the data will be averaged and lower confidence limits on the averages will be calculated and compared to the maximum values above. Stations whose lower confidence limit on the 5 year average total nitrogen or total phosphorus levels are above those levels will be considered to be not fully supporting the aquatic life use (Category 5). Active stations with fewer than ten different sampling days will be considered to have insufficient data and be placed in Category 3 for this assessment cycle. Segments with one or more stations whose lower confidence limit on their average nutrient concentrations are above the target values will be considered to be not fully supporting the aquatic life use (Category 5).

The following conditions will also result in segments being listed in Category 5:

1. There were documented cases of nuisance algal blooms or excessive macrophyte growth. These cases violate Section 4.1.1.3 of Delaware's Standards which require waters of the State to be free from substances that may result in a dominance of nuisance species;
2. Detailed, site-specific monitoring studies indicated a strong linkage between nutrient levels and indicators of eutrophication such as high chlorophyll-a concentrations, extreme daily variation in dissolved oxygen levels, and high sediment oxygen demand; or
3. For ERES waters, a long-term trend analysis indicates a statistically significant increase in nutrient levels over time. Such increases are inconsistent with the short-term goal of "holding the line" on water quality in ERES waters. Such increases are also inconsistent

with the long-term goal of restoring those waters, to the extent feasible, to their natural state.

### **Assessments of Total Suspended Solids in the Tidal Inland Bays Watershed**

For tidal portions of the Indian River, Rehoboth Bay and Little Assawoman Bay watersheds, the water quality criterion for total suspended solids (TSS) is a seasonal average of 20mg/l from March 1 to October 31. For those stations where sampling events occurred on at least ten different days during the assessment period, the available data for the months of March to October from each station will be averaged and confidence intervals on the averages will be determined. The lower confidence limit on the averages will be compared to the above values to assess attainment of desired TSS levels in these waters. Active stations with fewer than ten different sampling days will be considered to have insufficient data and be placed in Category 3 for this assessment cycle. Segments with one or more stations whose lower confidence limit on their seasonal average is above the criteria will be considered to be not fully supporting the aquatic life use (Category 5).

### **Primary Contact Recreation Use Assessments**

Generally, total enterococcus bacteria water quality samples are collected several times each year at each monitoring station. In addition, for all guarded beaches and many unguarded beaches, samples are collected much more frequently from mid-May through mid-September as part of beach monitoring activities pursuant to the Beaches Environmental Assessment and Coastal Health (BEACH) Act. Assessment of the above two situations for primary contact recreation use support will be as follows.

For segments with no beach monitoring, if sampling events occurred on at least ten different days during the assessment period, the geometric mean of the available enterococcus (colonies/100 ml) data for each station will be compared to the geometric mean values shown in the table below. Stations with fewer than ten different sampling days will be considered to have insufficient data (Category 3) to make a determination if the geometric mean criterion is met. For segments with no beach monitoring, one or more station geometric means above the values in the table will be considered to not be in support of the Primary Contact Recreation designated use (Category 5).

Water Type	Geometric Mean (Enterococcus colonies/100 ml) Criteria for Primary Contact Use
Fresh	100
Marine	35

Segments with beaches that are closed as a result of poor bacterial water quality data two or more times in a single calendar year will be considered not to support the primary contact designated use (Category 5).

## **Temperature Assessments**

Delaware surface water quality criteria indicate that, in freshwaters, no human induced increase of the daily maximum temperature above 86°F (30.0 °C) shall be allowed and in marine waters the maximum human induced temperature is 87°F (30.6 °C). Stations for which two or more sampling events are above the criteria and whose segments receive thermal discharges will be deemed not in support of the aquatic life use.

## **Assessment of Harvestable Shellfish Waters Use Support**

Delaware is a member of the Interstate Shellfish Sanitation Conference (ISSC), the administrative body of the National Shellfish Sanitation Program (NSSP). Delaware's Shellfish Sanitation Regulations are administered as per ISSC / NSSP standards and practices. Section 3.2.1.3 of said Regulations specifies data collection / closure criteria for Delaware shellfish waters, which include parameters constituting administrative closure of shellfish waters. Parameters that would trigger administrative closures in compliance with ISSC/NSSP standards may include theoretical pollution loading, sanitary shoreline survey information, and numerical total coliform data. All Delaware shellfish waters designated as other-than-Approved, which may include Prohibited, Seasonally Approved, Conditionally Approved, or restricted, are so designated on the basis of administrative decisions. Specifically, these criteria include: 1) theoretical pollution loading, which is determined to be the potential for intermittent pollution discharges, making detection of said theoretical releases non-detectable via conventional sampling methodology; 2) sanitary shoreline survey findings which indicate potential for theoretical pollution loading, also non-detectable via conventional sampling methodology; and 3) may include dilution of theoretical virus discharges from point sources; however, not corresponding to increases in total coliform levels. In order to comply with ISSC / NSSP requirements, Delaware samples all shellfish waters not administratively closed for other reasons for total coliform bacteria. Delaware's Shellfish Program is assessed under the auspices of the U.S. Food and Drug Administration, as per ISSC/NSSP standards and practices, and submits bacteriological water quality data to the U.S. Food and Drug Administration to demonstrate compliance.

To assess the harvestable shellfish designated use, the Department will consider the data and reports to FDA for waters that are not administratively closed. Waters that have been administratively closed for shellfish harvesting as a result of total coliform exceedances during the assessment period will be assessed as category-5.

## **Listing Criteria for Waters with Fish Consumption Advisories**

For purposes of developing Delaware's Integrated 305(b) Report and 303(d) List, the issuance of a "no consumption" or "limited consumption" fish advisory will be interpreted as a violation of Section 4.5.9.2.3 and Section 4.1.1.3 of Delaware's Surface Water Quality Standards. Those two narrative provisions provide, respectively, that 1) waters of the State shall be maintained to prevent adverse toxic effects on human health resulting from ingestion of chemically contaminated aquatic organisms; and 2) waters of the State shall be free from pollutants that may endanger public health. Any segment for which fish consumption advisories are in place as of the publishing of the Draft Integrated Report will be placed in Category 5 for each of the chemicals of concern included in each advisory. In the event that fish consumption advisories have been lifted, or any chemical of concern has been removed from an advisory, any requirements to

develop a TMDL for that chemical in that segment will be removed if the fish tissue data was originally the sole cause for placement of the segment on the 303(d) list. In waters impaired by toxic pollutants, with both fish consumption advisories and water column data, both fish tissue and water column data will be assessed independently against the applicable criteria.

For the Draft 2016 assessments, the Department incorporated the Fish Tissue Advisories that were issued by the Delaware Departments of Health and the Department of Natural Resources and Environmental Control on June 7, 2016. In those advisories, a number of rivers and creeks had fish consumption advisories that were less restrictive than prior advisories, but for more contaminants of concern. This was due to a minor technical change as opposed to worsening conditions. In fact, many of the contaminants of concern that were added (mostly organochlorine pesticides) were marginally over their respective levels of concern. Further, they show decreasing concentrations when viewed over the long term. The Department expects those contaminant levels to continue to decline in the fish due to natural attenuation and in response to ongoing improvements in stormwater management and other controls. Thus, the TMDL dates for these newly listed contaminants of concern in fish were assigned a low priority with the expectation that the listings will be removed in the interim between listing and the target dates assigned. In future listing cycles, and subject to stakeholder input, the Department anticipates delisting those contaminants if trends show the concentrations have or are likely to fall below levels of concern in a reasonable time frame without TMDL development.

### Ammonia assessments

In fresh waters, ammonia's toxicity is known to be controlled by both the temperature and pH of the water. Delaware's ammonia criteria are based on the presence or absence of early life stages of fish and specify that the criterion should not be exceeded more than one time in a three-year period. The applicable criterion is calculated for each sampling event.

For stations whose average salinity during the assessment period is below 5 ppt, total ammonia as nitrogen, temperature and pH data will be used to compare the total ammonia data to the criterion calculated according to the following formulas:

When fish early life stages are present:

$$\text{Criterion} = \frac{0.0577}{1 + 10^{7.688 - \text{pH}}} + \frac{2.487}{1 + 10^{\text{pH} - 7.688}} * \text{MIN} (2.85, 1.45 * 10^{0.028 * (25 - T)})$$

When fish early life stages are absent:

$$\text{Criterion} = \frac{0.0577}{1 + 10^{7.688 - \text{pH}}} + \frac{2.487}{1 + 10^{\text{pH} - 7.688}} * [1.45 * 10^{0.028 * (25 - \text{MAX}(T, 7))}]$$

If two or more sampling events from the same station result in exceedances of the calculated criteria within three years, the station will be deemed not supported for aquatic life use support based on ammonia toxicity.

### **Assessments of Aquatic Life Use Support Using Site-Specific Data That Results from Environmental Assessments and Other Programs**

In the normal course of business, the Department requests, receives and evaluates water quality data for various environmental programs. Similar data may also come from other parties (e.g., State, Federal, or local agencies). The Department will use those site-specific studies to compare water quality data to the applicable water quality standard(s) and make assessment and listing decisions for the affected segments. If the data show no water quality criteria are exceeded and no uses are impaired, no further listing action will be taken. If the data are ambiguous or inconclusive, the segment will be listed in Category 3. If water quality criteria are exceeded or uses are impaired as a result of a contaminated site, and the owners of the site are making substantial progress (as determined by the Department) toward correcting the pollution problem, the segment will be listed in Category 4 if an enforceable regulatory mechanism has been identified and implemented. If it appears that there is a water quality problem related to a contaminated site, and that substantial progress is not likely in the near future, the segment will be listed in Category 5.

### **Assessments of Waters of Exceptional Recreational or Ecological Significance**

ERES is a special use designation in Delaware's Surface Water Quality Standards that applies to waters deemed to be of Exceptional Recreational or Ecological Significance. The short-term goal for ERES waters is to "hold the line" on pollution and the long-term goal is to restore ERES waters, to the maximum extent practicable, to their natural condition.

The ERES designated use will be assessed using data from the period January 1, 1998 through December 2014 for total nitrogen and total phosphorous concentrations to assess trends for those parameters. Seasonality for each parameter at each station will be determined using the Kruskal-Wallis test. Parameters showing no seasonality will be assessed using Sen's slope estimator.. Parameters showing seasonality will be evaluated using seasonal Kendall slope estimations. Segments with one or more stations that show statistically significant increases in total nitrogen or total phosphorus levels will be considered to not be in attainment of the ERES designated use.

### **Assessments of Biology and Habitat**

The Department is working with the EPA to address prior listings for Biology and Habitat. As new stressor analyses and other data and information become available, appropriate measures will be taken to address these listings. Where no specific pollutant can be determined, the Department will delist those segments (move to category 4b or 4c as needed) and address water quality issues through restoration and other efforts as funding is available. If specific pollutants can be determined, TMDLs or other actions will be taken to address those pollutants.

### **Setting Priorities for Water Quality Limited Segments Still Needing TMDLs**

The Department has been working with EPA and other states to develop and implement EPA's Updated Framework for Implementing the Clean Water Act 303(d) Program Responsibilities (the Vision) in this and future integrated reports. EPA and the

States and Tribes worked collaboratively to develop the Vision. More information about the Vision is available online at <http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/programvision.cfm>. For the 2016 cycle, EPA's Integrated Reporting Guidance documents are available online here <http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/guidance.cfm>. Along with most other states, the Department committed to developing documents describing our Prioritization strategies for the 2016 and future Integrated Reports. The draft Prioritization document is attached to this methodology.

### **Rationale Used to Designate a Lower Category for Segments Previously Designated for TMDL Development**

The Department may move segments from prior 303(d) Lists (equivalent to Category 5) to another category based on any of the following factors, and will document the reasons for doing so on a case-by-case basis. Once a TMDL has been promulgated and approved by the EPA, it is in place until it has been rescinded by the Department following applicable Departmental procedures.

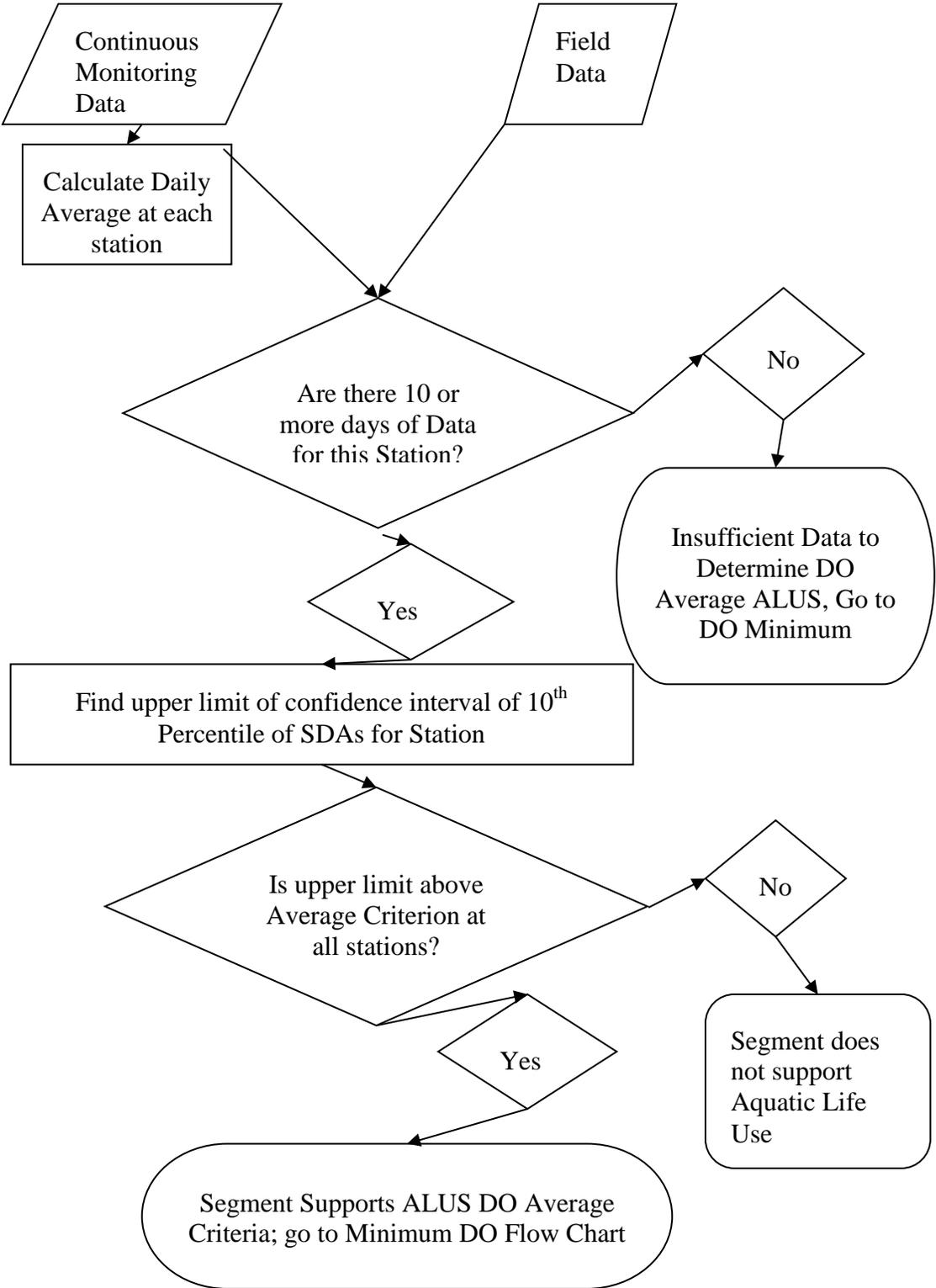
- The assessment and interpretation of more recent or more accurate data demonstrate that the applicable WQS(s) is being met. (Move to category 1)
- The results of more sophisticated water quality modeling demonstrate that the applicable WQS(s) is being met. (Move to category 1)
- Demonstration that flaws in the original analysis of data and information led to the water being incorrectly listed. (Move to category 1)
- The development of a new listing methodology, consistent with State WQSs and federal listing requirements, and a reassessment of the data that led to the prior listing, concluding that WQSs are now attained. (Move to appropriate category)
- A demonstration pursuant to 40 CFR 130.7(b)(1)(ii) that there are effluent limitations required by State or local authorities that are more stringent than technology-based effluent limitations required by the CWA and that these more stringent effluent limitations will result in the attainment of WQSs for the pollutant causing the impairment. (Move to category 4A or 4B until data and analysis support move to Category 1)
- A demonstration pursuant to 40 CFR 130.7(b)(1)(iii) that there are other pollution control requirements required by State, local, or federal authority that will result in attainment of WQSs for a specific pollutant(s) within a reasonable time. (Move to category 4A or 4B until data and analysis support move to Category 1)
- Documentation that the State included on a previous Section 303(d) List an impaired water that was not required to be listed by EPA regulations; e.g., waters where there is no pollutant associated with the impairment. (Move to category 1 or 4C as appropriate)
- Approval or establishment by EPA of a TMDL since the last Section 303(d) List. (Move to category 4A or 4B until data and analysis support move to Category 1)

Other factors may also be used to change categories on a case by case basis, subject to EPA approval and appropriate stakeholder involvement.

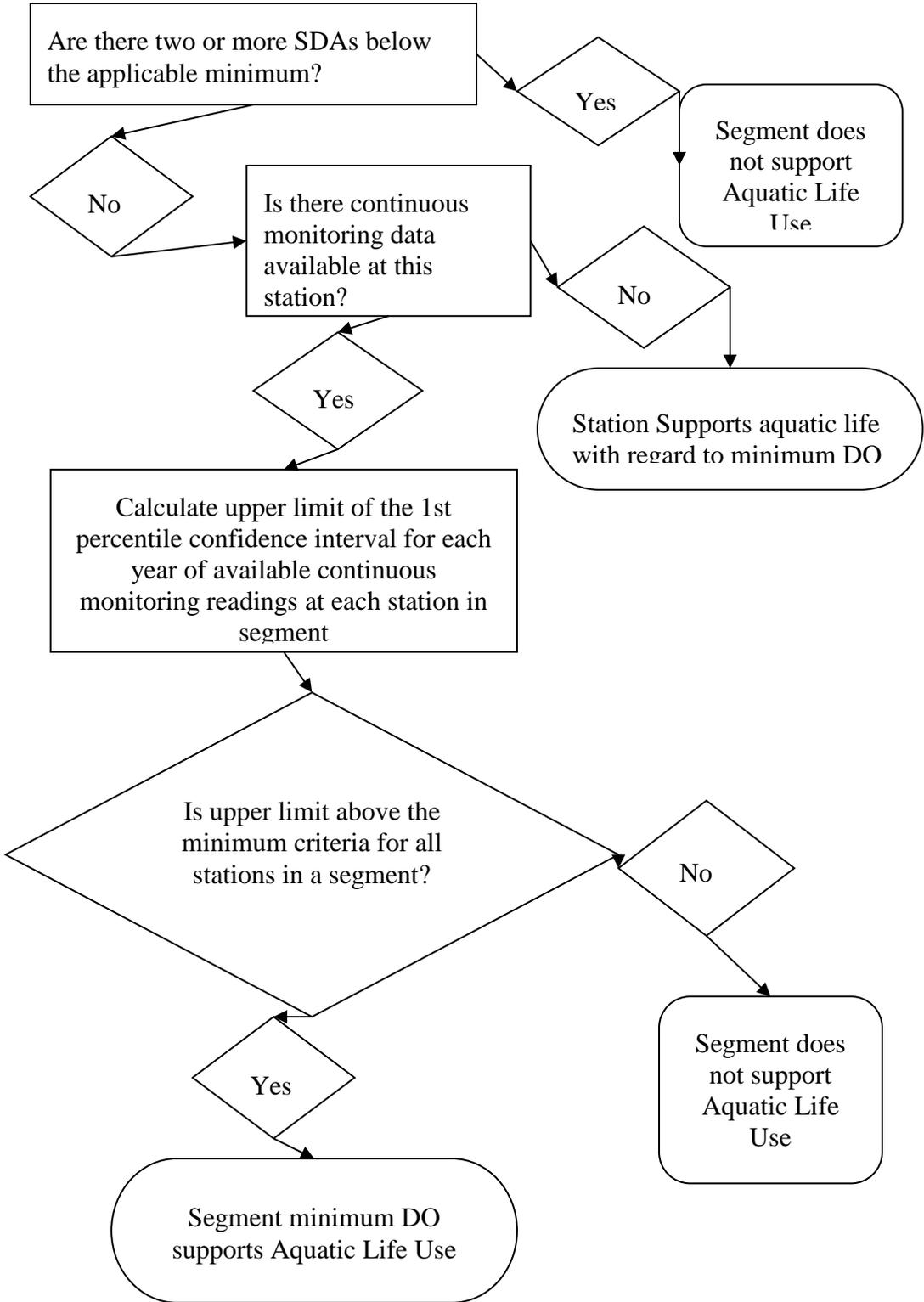


## **Flow Charts for Designated Use Attainment**

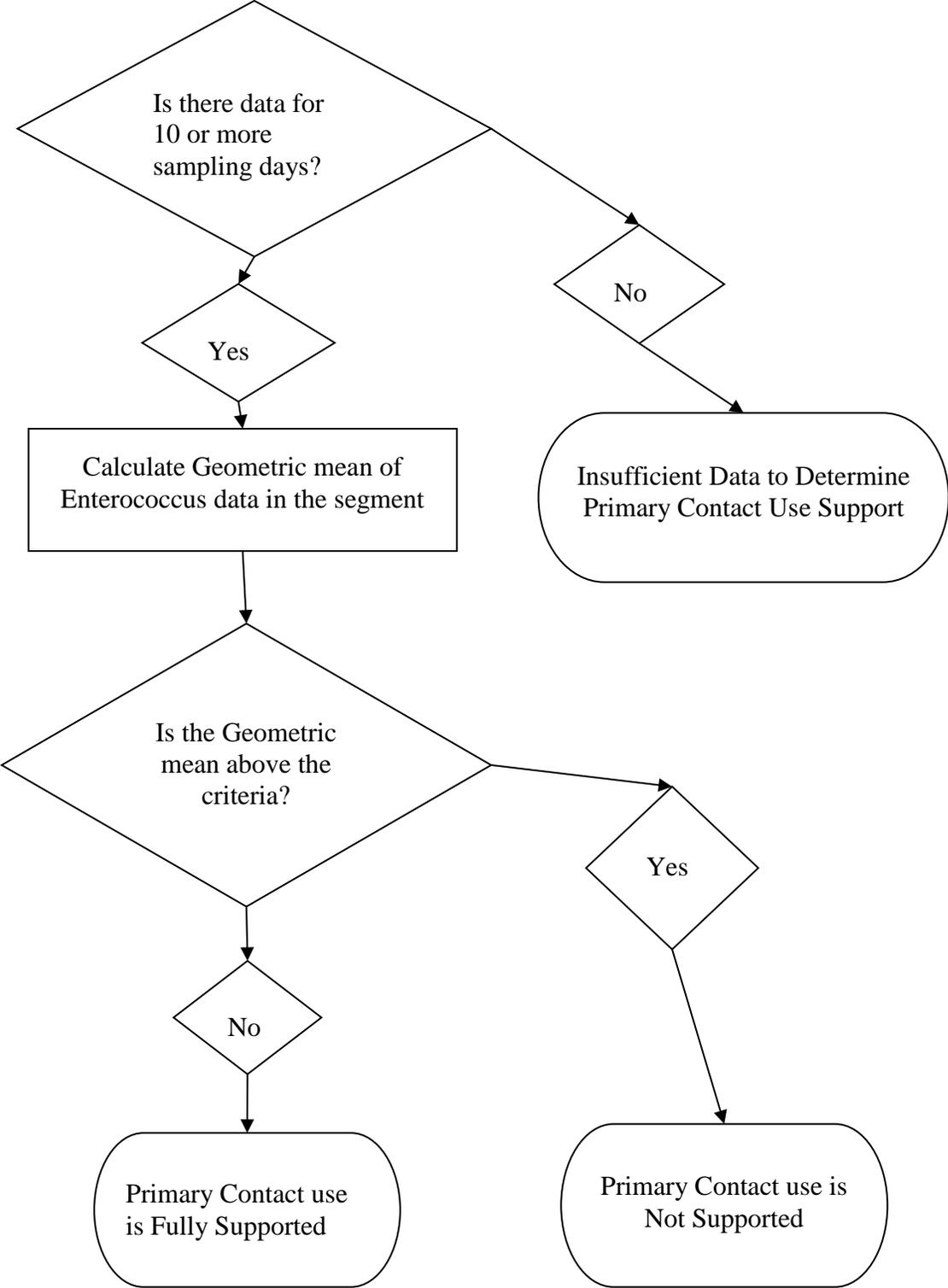
**Assessment of Aquatic Life Use Support Using Average Dissolved Oxygen Criteria**



**Assessment of Aquatic Life Use Support Using Minimum Dissolved Oxygen Criteria**



**Assessment of Primary Contact Use Support in Segments that do not have Beach Monitoring Programs**



**Assessment of Primary Contact Use Support in Segments with Beach Monitoring Programs**

