

Reporting Results Below Quantification

This document provides guidance to the permittee on how to use results that are less than quantification levels to calculate and/or report daily concentrations, seven-day averages, monthly averages, and geometric means.

Introduction

For purposes of National Pollutant Discharge Elimination System (NPDES) compliance reporting, the Department of Environment, Great Lakes, and Energy (EGLE) defines Quantification Level as follows:

Quantification Level means the measurement of the concentration of a contaminant obtained by using a specified laboratory procedure calculated at a specified concentration above the detection level. It is considered the lowest concentration at which a particular contaminant can be quantitatively measured using a specified laboratory procedure for monitoring of the contaminant.

EGLE acknowledges that different laboratories may use alternate terms to refer to the same or a functionally equivalent concept as defined above. Laboratories may, for example, use ND, for 'Non Detect,' or they may use RL, for 'Reporting Level.' EGLE uses the term 'quantification level' in the NPDES permit, however, and this is the term that will be referenced herein.

For most parameters, if you have results that are less than the quantification levels and you need to calculate daily values or various averages and means, compliance with your NPDES permit requires that you use the quantification levels themselves as the values in your calculations and then report less than that calculated result. For example, use "1" in your calculations when individual results are "<1 ct/100 ml" or "<1 ug/l." *You should use the quantification level actually reported by your laboratory for the parameter/sample result in question.*

For most parameters, any calculation made with at least one sample result below quantification shall be reported as less than the calculated value X (i.e., "<X"). For 7-day or monthly averages, use the Daily values for your calculations, using the numerical values for any results less than quantification levels but then reporting the final result as less than the calculated value.

For a small subset of parameters, analytical results below quantification may be reported as zero on the DMRs, and zeros may be used in place of results below quantification in any calculations made for averages and loadings. These parameters are identified on page 4 of this document, under the heading *Exceptions*.

For all other parameters, as you review the examples on the following pages, keep in mind the three key scenarios you may encounter: 1) Your laboratory has reported results to you *below* an *acceptable* quantification level, 2) Your laboratory has reported results to you *at or above* an *acceptable* quantification level; and 3) Your laboratory has reported results to you *below* an *unacceptable* quantification level.

See [Table 7 of the permit application Appendix](#) for a current list of the EGLE's maximum acceptable quantification levels for selected parameters. Refer also to your NPDES permit for additional requirements that may pertain to this topic.

Examples

Daily Reporting When No Calculation is Necessary

Although Available Cyanide is used in the following three examples, the same approach applies to any pollutant for which EGLE specifies a maximum acceptable quantification level (QL) and for which no calculation is necessary for DMR Daily reporting.

In the following three examples, your NPDES permit requires monitoring and reporting for Available Cyanide. You check your permit and [Table 7 of the permit application Appendix](#) and see that EGLE specifies a maximum quantification level (QL) of 2 ug/l for NPDES compliance reporting for Available Cyanide.

- Your laboratory reports to you the following sample result:

Table 1: Result Below Acceptable QL

Analyte	Analytical Result	RL	Unit
Cyanide, Available	ND	2.0	ug/l

You would report "<2.0" ug/l Available Cyanide on the DMR Daily tab.

- Your laboratory reports to you the following sample result:

Table 2: Result At or Above Acceptable QL

Analyte	Analytical Result	QL	Unit
Cyanide, Available	2.0	2.0	ug/l

You would report "2.0" ug/l Available Cyanide on the DMR Daily tab.

- Your laboratory reports to you the following sample result:

Table 3: Result Below Unacceptable QL

Analyte	Analytical Result	RL	Unit
Cyanide, Available	<3.0	3.0	ug/l

You would report "<3.0" ug/l Available Cyanide on the DMR Daily tab. Note that in this example, your lab has used an unacceptable QL. It is unacceptable because it is higher than the maximum allowable QL of 2 ug/l specified by EGLE.

Daily Reporting When a Calculation is Necessary

- Total BTEX daily concentration: One grab sample is taken in a day as follows: Benzene 8.0 ug/l, Toluene <5.0 ug/l, ethylbenzene <1.0 ug/l, xylenes <3.0 ug/l. Calculate as follows:

$$8.0 \text{ ug/l} + 5.0 \text{ ug/l} + 1.0 \text{ ug/l} + 3.0 \text{ ug/l} = 17.0 \text{ ug/l}$$

Report as "<17.0" ug/l on the DMR Daily tab.

- Total Residual Chlorine daily concentration: The permittee takes 3 grab samples in one day with results of <10 ug/l, 38 ug/l, and 60 ug/l. Calculate as follows:

$$\frac{10 \text{ ug/l} + 38 \text{ ug/l} + 60 \text{ ug/l}}{3} = 36 \text{ ug/l}$$

Report "<36" ug/l on the DMR Daily tab.

- Daily Loadings: Multiply the daily concentration (in mg/l) by the total daily flow and the appropriate conversion factor. For a daily concentration below quantification, use the numerical portion of the daily concentration to calculate the loading and report less than the result. If the daily concentration of Available Cyanide is <2.0 ug/l and total daily flow is 0.5 MGD, you would multiply the numeric portion of the concentration (in mg/l) x flow (MGD) x 8.34 (conversion factor) to obtain daily loading in pounds per day (lb/day) as follows:

$$0.002 \text{ mg/l} \times 8.34 \times 0.5 \text{ MGD} = 0.00834 \text{ lbs/day}$$

Report "<0.0083" lbs/day on the DMR Daily tab (rounded result).

7-day and Monthly Average Calculations

- Total BTEX monthly average: Use Total BTEX daily concentration results to calculate the Monthly Average. If weekly monitoring shows results of <17 ug/l, <10 ug/l, <10 ug/l, and <28 ug/l for daily concentrations of Total BTEX, calculate as follows:

$$\frac{16 \text{ ug/l} + 10 \text{ ug/l} + 10 \text{ ug/l} + 28 \text{ ug/l}}{4} = 16 \text{ ug/l}$$

Report as "<16" ug/l on the DMR Summary tab.

- Mercury monthly average: Use the Total Mercury values (corrected, if applicable) to calculate the monthly average. If weekly monitoring shows results of <0.5 ng/l, 1 ng/l, 0.7 ng/l, and 0.8 ng/l, calculate as follows:

$$\frac{0.5 \text{ ng/l} + 1 \text{ ng/l} + 0.9 \text{ ng/l} + 0.8 \text{ ng/l}}{4} = 0.8 \text{ ng/l}$$

Report "<0.8" ng/l on the DMR Summary tab.

Use the same procedure to calculate 12-month rolling averages: add monthly averages from the previous 11 months, divide by twelve, and report less than that calculated value.

- Monthly average loadings: Monthly average loading is the sum of the daily loading(s) of a parameter divided by the number of daily loadings determined during a discharge event. Available Cyanide daily loadings are <0.00017 lbs/day and <0.00019 lbs/day. Calculate the monthly average loading as follows:

$$\frac{0.00017 \text{ lbs/day} + 0.00019 \text{ lbs/day}}{2} = 0.00018 \text{ lbs/day}$$

Report “<0.00018” lbs/day on the DMR Summary tab.

- For 7-day averages with daily concentrations that are less than the quantification level, calculate using the quantification level as the value and report less than the calculated result.
- Note that when monitoring is done only once each month, the monthly average concentration will be the same as the daily concentration since that one sample represents the entire month. For example, one sample of BTEX is taken in a month. The daily value is calculated and reported as “<30” ug/l. The monthly average would also be reported as “<30” ug/l because 30 divided by 1 (sample collected) equals 30.

Exceptions

Currently, EGLE makes an exception for a limited number of parameters. Analytical results below quantification may be reported as zero on the DMRs, and zeros may be used in place of results below quantification in any calculations made for averages and loadings, for the following parameters only:

BOD5

CBOD5

COD

TOC

Ammonia Nitrogen (as N)

Total Suspended Solids

Total Phosphorus

WET

Revised August 9, 2019
Christine Aiello
Permits Section, WRD, EGLE