

# REPORTING RESULTS BELOW QUANTIFICATION FOR SURFACE WATER DISCHARGES

## GUIDANCE FOR NPDES PERMITTEES

This document provides guidance to the National Pollutant Discharge Elimination System (NPDES) permittee on how to use sample results that are less than quantification levels to calculate and/or report daily concentrations, 7-day averages, monthly averages, and geometric means.

### INTRODUCTION

For purposes of 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 other terms to refer to the same or a functionally equivalent concept as that defined above. Laboratories may, for example, use ND for “Non-Detect,” RL for “Reporting Level,” LOQ for “Level of Quantitation,” etc. EGLE uses the term “quantification level” (QL) 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 QL and you need to calculate daily values or various averages and means, compliance with your NPDES permit requires that you use the QLs themselves as the values in your calculations and then report less than (“<”) your calculated result. For example, use the number “1” in your calculations when individual results are “<1 ct/100 ml” or “<1 ug/l.”

For most parameters, any calculation made with at least one sample result below the QL 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, use the numeric values for any results less than QLs, and then report the final result as less than (“<”) the calculated value.

For a very small subset of parameters, analytical results below QL may be reported as zero on the Discharge Monitoring Reports (DMR), and zeros may be used in place of results below QL in any calculations made for averages and loadings. These parameters are identified on page 5 of this document under “Exceptions.”

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

To ensure that samples are analyzed using sufficiently sensitive methods as required by your NPDES permit, EGLE specifies maximum acceptable QLs for selected parameters in your permit and in [Table 7 of the permit application Appendix](#). Refer also to your 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 has specified a maximum acceptable 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 review your permit and [Table 7 of the permit application Appendix](#) and see that EGLE specifies a maximum acceptable QL of 2 micrograms per liter (ug/l) for NPDES compliance reporting for Available Cyanide.

#### **Example 1: Result Below Acceptable QL**

- **Scenario A** – Your laboratory reports to you the following sample results:

<i>Analyte</i>	<i>Result</i>	<i>RL</i>	<i>Units</i>
Cyanide, Available	ND	2.0	ug/l

For Scenario A., you would report “<2.0” ug/l Available Cyanide on the DMR Daily tab.

- **Scenario B** – Your laboratory reports to you the following sample results:

<i>Analyte</i>	<i>Result</i>	<i>LOQ</i>	<i>Units</i>
Cyanide, Available	1.5	1.8	ug/l

For Scenario B., you would report “<1.8” ug/l Available Cyanide on the DMR Daily tab. You would *not* report the lab’s result of 1.5 ug/l, because that result is below the lab’s LOQ and is therefore below the level at which the lab can determine a precise sample concentration.

**Example 2: Result At or Above Acceptable QL**

Your laboratory reports to you the following sample results:

<i>Analyte</i>	<i>Result</i>	<i>QL</i>	<i>Units</i>
Cyanide, Available	2.0	2.0	ug/l

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

**Example 3: Result Below Unacceptable QL**

Your laboratory reports to you the following sample results:

<i>Analyte</i>	<i>Result</i>	<i>RL</i>	<i>Units</i>
Cyanide, Available	<3	3	ug/l

You would report “<3” 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 acceptable QL of 2 ug/l specified by EGLE for Available Cyanide. A new sample should immediately be taken and analyzed by a lab that can comply with the maximum acceptable QL established by EGLE for this parameter.

**Daily Reporting When a Calculation is Necessary**

- Total Benzene, Toluene, Ethylbenzene and Xylene (BTEX) daily concentration: One grab sample is taken in a day with the following results:

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 milligrams per liter [mg/l]) by the total daily flow and the appropriate conversion factor. For a daily concentration below QL, use the numeric 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 million gallons per day (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 <16 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, 0.9 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 12, 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 QL, calculate using the QL as the value and report less than the calculated result.
- Note that when monitoring is conducted 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 (the number of samples collected in the reporting period) equals 30.

## **EXCEPTIONS**

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

- Five-day Biochemical Oxygen Demand (BOD5)
- Five-day Carbonaceous Biochemical Oxygen Demand (CBOD5)
- Chemical Oxygen Demand (COD)
- Total Organic Carbon (TOC)
- Ammonia Nitrogen (as N)
- Total Suspended Solids (TSS)
- Total Phosphorus
- Whole-effluent Toxicity (WET)

## **MORE INFORMATION**

For more information or assistance, please contact your Water Resources Division (WRD) [District Compliance Manager](#) or visit [Michigan.gov/EGLENPDES](https://Michigan.gov/EGLENPDES).

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