

# the Rain events

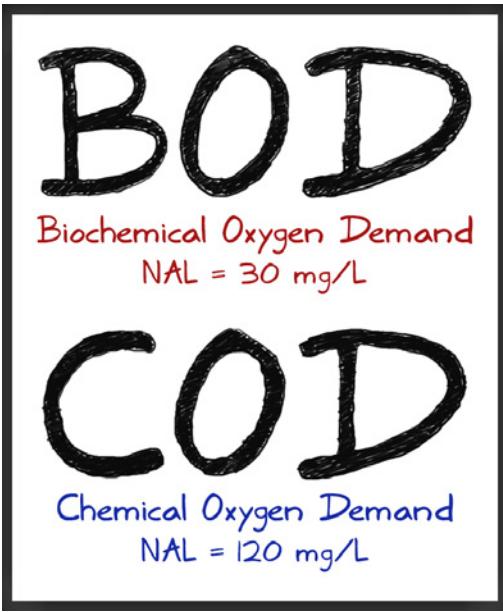
|  |                                   |                                       |                                       |                                     |   |
|--|-----------------------------------|---------------------------------------|---------------------------------------|-------------------------------------|---|
| phosphorus<br>15<br><b>P</b><br>30.974 | oxygen<br>8<br><b>O</b><br>15.999 | lutetium<br>71<br><b>Lu</b><br>174.97 | tantalum<br>73<br><b>Ta</b><br>180.95 | nitrogen<br>7<br><b>N</b><br>14.007 | tennessine<br>117<br><b>Ts</b><br>[294] |
|--|-----------------------------------|---------------------------------------|---------------------------------------|-------------------------------------|---|

Part 4 of a 12-part **exclusive series** on understanding storm water pollutants

While there might be many pollutants on the IGP Table 2 list that aren't well understood, BOD and COD take the cake. They both measure the demand for oxygen, right? So what's the difference? Does it matter which one you use? And when the laboratory results come back high, how can you lower your numbers? These are complicated questions, but in this month's edition of **The Rain Events**, we're going to attempt to give some answers.

First, is there actually a real-world difference between COD and BOD? COD stands for *chemical oxygen demand*, and BOD for *biochemical oxygen demand* (sometimes also called *biological oxygen demand*). BOD is a measurement of the amount of oxygen required by bacteria while stabilizing decomposable organic matter in water under aerobic conditions. COD is the measurement of the total quantity of oxygen needed to completely oxidize all organic matter in the water to carbon dioxide and water. Both of these parameters report the same thing – the amount of oxygen (expressed in milligrams per liter) that is consumed in the sample during the analytical procedure. Higher amounts of organic materials will require more oxygen to oxidize, and will result in a higher analytical result. But even though we're discussing BOD and COD in our industrial pollutant series, it's important to know that BOD and COD are not pollutants – they are indicators of the presence of pollutants.

The difference between BOD and COD is the analytical procedure. The BOD test involves introducing a bacteria culture into the sample, and measuring the amount of oxygen consumed by organic compounds as they are oxidized by the bacteria. The BOD analytical procedure takes 5 days. COD uses a strong oxidizer (usually potassium dichromate) to oxidize all of the organic compounds in a sample, while recording the amount of oxygen



consumed during the oxidation process. The analytical process for COD is much shorter than BOD, usually lasting around three hours. Because potassium dichromate is a faster and more aggressive oxidizer than bacteria, the COD analysis will return higher numbers than the BOD analysis, especially where there are higher levels of biologically-resistant compounds.

So, which test is more applicable for your facility? It all depends on what pollutants and compounds you are testing for. If the expected pollutants are good food sources for bacteria (i.e., oils, compost, food waste, sewage), then the BOD analysis would be a good fit. The

COD analysis should be used when the main expected pollutants are toxic to or are not as easily oxidized by bacteria (i.e., volatile organic compounds, lignans, tannins, etc.)

What could cause elevated BOD and COD levels on a typical industrial facility, and how can you prevent elevated BOD and COD levels? Remember, oxidizing organic materials sap the dissolved oxygen out of your storm water. If there are any foreign materials in your storm water runoff, you're probably going to have high BOD or COD results. But beware – some elements can give a false positive. For instance, ammonia and phosphates can feed bacteria and cause a high BOD result. Of course, ammonia and phosphorous have their

own analytical methods – so if your industrial processes involve either of those chemicals, use the specific analytical method to test for that chemical, not BOD or COD. And keep in mind that while a high sediment load can increase oxygen demand, BOD and COD are not necessarily linked to TSS. We've seen outfalls with TSS numbers in the 40s-50s that have COD results over 400.

The best way to prevent high BOD or COD numbers is to prevent your industrial materials from coming in contact with your storm water runoff. Practice good housekeeping, and store materials and equipment under cover wherever possible. Make sure any spills are promptly cleaned up. Treatment techniques will vary depending on what pollutant is causing your elevated numbers, but trying to lower BOD and COD numbers by treatment can be tricky. Most of the time, it's best to focus on keeping the pollutants out of your storm water, rather than trying to remove it once it's already been introduced. But, there are a few advanced treatment systems (like those from StormwaterRx and Pure Effect) that can help reduce BOD and COD numbers. ☀

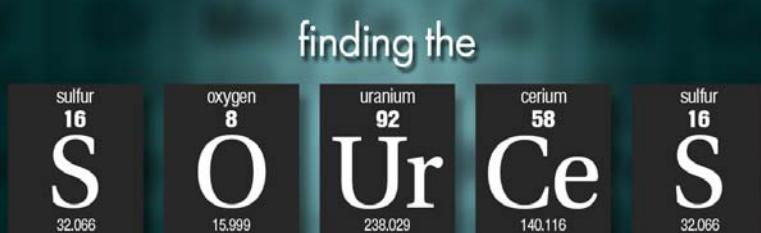
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High BOD or COD results come from oxidizing organic matter. What is organic matter? Organic matter is any carbon-based compound found in natural, engineered, terrestrial, or aquatic environment. Organic compounds are extremely numerous, and more varied than you may think. Some of the more common ones include:

- Green waste (leaves, compost, wood chips, sawdust, etc.)
- Garbage and recyclable materials (trash, food waste, cardboard, fats/oils, etc.)
- Petroleum products (motor oil, gasoline, diesel, etc.)
- Vehicle fluids (ethylene glycol, hydraulic fluid, etc.)
- Sugars and alcohols

Have questions about the Industrial General Permit?  
Give us a call at (209) 334-5363, ext. 114

## "To Do List" for May:

- Perform the May monthly inspection
- If you have not done so yet, perform your Annual Comprehensive Facility Compliance Evaluation.
- If any problems are found during the Annual Evaluation, revise the SWPPP, and implement changes within 90 days

## HELPFUL TIP

The BOD and COD analytical tests detect the presence of organic matter in your sample – which, as you may have gathered from the other articles, includes a huge range of chemicals and materials. So, before specifying COD or BOD as an "activity assessment" test in keeping with Section XI.B.6.c of the IGP, make sure there is not a more specific test you can use. For instance, instead of using BOD to test for antifreeze, try using the ethylene glycol analysis (EPA Method 8015.B). And it's always a good idea to contact your lab for advice.

## FUN FACT

The BOD 5-day test originated in England over concerns of pollution in the Thames River. In 1878, the Princess Alice paddle steamer disaster resulted in the death of 600 people, some of whom died from complications caused by raw sewage in the river. In 1908, scientists from The Royal Commission on Sewage Disposal found that it took 5 days for sewage dumped in the Thames to reach the ocean. In their final report to Queen Victoria (which you can read [here](#)), the Royal Commission established the same BOD test and 30 mg/L standard which is still used today by industrial permittees.

*Please contact us if you have any questions ...  
The Rain Events*

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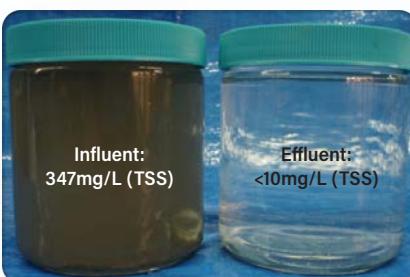


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| Aquip Model | Treatment Rate (gpm)<br>Typical Range* | Sizing Guideline<br>(acres)* | Footprint<br>(feet) |
|-------------|--|------------------------------|---------------------|
| 10          | 10 - 20                                | < 0.25                       | 3' x 9'             |
| 25          | 25 - 50                                | 0.25 - 0.5                   | 5' x 9'             |
| 50          | 50 - 100                               | 0.5 - 1                      | 7' x 12'            |
| 80          | 80 - 160                               | 1 - 2                        | 7' x 16'            |
| 110         | 110 - 220                              | 2 - 3                        | 8' x 18'            |
| 160         | 160 - 320                              | 3 - 4                        | 8' x 27'            |
| 210         | 210 - 420                              | 4 - 5                        | 8' x 32'            |
| 300         | 300 - 600                              | 5 - 8                        | 13' x 36'           |
| 400         | 400 - 800                              | 6 - 10                       | 13' x 47'           |

\* Varies by region



Aquip (uh-kwip) is a patented<sup>†</sup>, enhanced media filtration system for industrial stormwater applications. This high-performing stormwater treatment BMP removes fine particulates and dissolved pollutants in a simple and easy-to-use configuration. Aquip is typically installed above ground, downstream of a single pump station.

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“BOD - Biological Oxygen Demand is the amount of dissolved oxygen needed by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period.”

But what does that mean to your industrial facility and the new permit? Depending on the nature of your business and the materials exposed to rain water you may have high BOD water discharging to your outfall. This may take your facility to Level II and give you unwanted exposure to regulators and environmental groups.

**Sources of BOD:**

- Sugar (food or recycling industries)
- Paper
- Cutting Oil
- Mulch or Compost
- Livestock

**How to reduce BOD if it is above the Numeric Action Level (NAL):**

- Source Control – Cover or move BOD source items indoors if possible
- Sweeping
- Waste Liquid Disposal – Collect and haul away waste liquids from high BOD sources

If these BMP's are not successful then you may need to consider storm water treatment. BOD can be treated to below the NAL's with the proper treatment design including chemical and media technologies. These same systems can also reduce COD, heavy metals, solids, oil & grease, nutrients and other contaminants.

To learn more about industrial storm water treatment visit [www.pureeffect.com](http://www.pureeffect.com) or call your local equipment provider.



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- Range: -1 to 15 pH
- Temperature Range: 32° to 122° F
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- Battery Life: 500 hours under normal conditions
- Dimensions: 6.5"Long x 1.5" Diameter

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## Storm Water Contest...

Each month, we invite our readers to participate in a contest to test their knowledge of the Industrial General Permit and their storm water compliance program. We enter all submittals to our monthly newsletter question into a drawing, and one person is selected at random to receive a \$25 gift card. Last month's question was:

**Can the analytical test for ferrous iron and ferric iron be performed from the same sample? (Hint: Listen to "The Science of Iron" podcast)**

Congrats, **Rosemary Martinez**, you're correct! The analytical tests for ferrous iron and ferric iron are not run from the same sample. Ferrous iron will need its own separate sample container. The results from total iron and ferrous iron will be used to calculate ferric iron.

## This Month's Contest Question:

**You are writing a SWPPP for your lumber yard facility, and you decide you need to sample to see if sawdust is affecting your storm water runoff. Should you use the BOD or COD test?**

By June 19, 2017, submit your response to the above question by sending an email to [jteravskis@wqr-sw.com](mailto:jteravskis@wqr-sw.com). All persons submitting the correct answer will be placed in a drawing. The winner will receive a \$25 gift card to Cold Stone Creamery.



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