

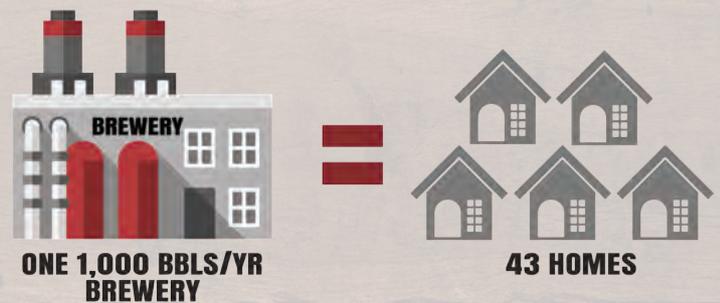
CRAFT BREWERY WASTEWATER PROGRAM



Brewery Wastewater Characteristics

Brewing craft beer produces high-strength liquid waste that has to be properly managed so as not to cause environmental harm or nuisance concerns. There are two primary measurements for quantifying the strength of wastewater - Biological Oxygen Demand (BOD_5) and Total Suspended Solids (TSS). Brewery wastewater varies based on the type of beer being brewed, but typically has a BOD_5 of 5,000 mg/L - and can have a BOD_5 as high as 50,000 mg/L if imperial beers are brewed. The TSS can vary widely depending on how spent grains are managed, but brewery wastewater typically has a TSS of 2,500 mg/L and can be found as high as 6,000 mg/L. In contrast, the wastewater from a typical single-family home ranges from approximately 110-350 mg/L for both BOD_5 and TSS.

The volume of wastewater generated from the beer making process can vary widely depending on water use efficiency measures. A typical brewery will produce approximately 4 gallons of wastewater for every gallon of beer produced. So a facility that produces 1,000 barrels (31,000 gallons) of beer per year will discharge approximately 124,000 gallons of wastewater per year.



City of Kennewick Simplified Discharge Approach

Most industrial wastewater is required to be pre-treated to a strength that is typical of residential-strength per the City of Kennewick code ($BOD_5 < 240$ mg/L and $TSS < 250$ mg/L) prior to discharge to the sewer system. This requires on-site wastewater treatment facilities that have high capital cost as well as operational costs. Recognizing that brewers are more interested in brewing beer than operating wastewater treatment plants, the City of Kennewick offers a unique program to simplify management of wastewater from breweries. Provided that breweries provide a minimal level of pre-treatment, the City allows some breweries to discharge the high-strength wastewater to the City sewers - provided they pay a strong waste surcharge. This allows the City to utilize their existing wastewater treatment assets to treat the wastewater but ensures that the high-strength dischargers pay their fair share for treatment.

If a flowmeter is not available for calculating the wastewater flow from brewing operations, then the volume of wastewater will be quantified based on the water consumption meter. This requires a water meter dedicated to the brewing operations of the facility (separate from restrooms and restaurant uses). The strength of the wastewater is determined based upon sampling and laboratory analysis provided by the City. The City will periodically sample at the designated monitoring point that is separate from sanitary and restaurant drains - see Figure 1.

Calculating the High-Strength Surcharge

As an example, a 1,000 barrel brewery discharging 124,000 gallons of waste per year after minimum pretreatment may have an average BOD₅ and TSS concentration around 5,000 and 1,000 mg/l, respectively. The allowable base discharge is 240 and 250 mg/l (BOD₅ & TSS), which in this example results in an excess discharge strength of 4,760 and 750 mg/l, respectively. The following formula shows how the annual mass discharge is calculated:

$$\text{BOD}_5 \frac{\text{pounds}}{\text{year}} = 124,000 \frac{\text{gallons}}{\text{year}} \times 4,760 \frac{\text{mg}}{\text{L}} \times 0.00000834 \frac{\text{pounds} \cdot \text{L}}{\text{year} \cdot \text{mg}} = 4,923 \frac{\text{pounds BOD}_5}{\text{year}}$$

$$\text{TSS} \frac{\text{pounds}}{\text{year}} = 124,000 \frac{\text{gallons}}{\text{year}} \times 750 \frac{\text{mg}}{\text{L}} \times 0.00000834 \frac{\text{pounds} \cdot \text{L}}{\text{year} \cdot \text{mg}} = 776 \frac{\text{pounds TSS}}{\text{year}}$$

At this time the City charges \$0.38 and \$0.33 per pound of BOD₅ and TSS, respectively (KMC 14.23.140); therefore, the annual cost to discharge high strength waste for this example 1,000 barrel brewery would be \$1,871 for BOD₅ and \$256 for TSS. This is in addition to the sewer bill that is calculated based upon metered water consumption per KMC 14.26.

Minimum Pre-Treatment Requirements To Qualify For High-Strength Surcharge Option

With the High-Strength Surcharge option, breweries can evaluate whether it is more economical to pay the High-Strength Surcharge or invest in their own on-site wastewater pre-treatment facilities. However, even those breweries utilizing the High-Strength Surcharge option must provide some minimum level of pre-treatment per KMC Chapters 14.22 and 14.23, including:

- 🔧 **Temperature:** Wastewater must not exceed 150 degrees Fahrenheit. This may require holding wastewater in batch tanks until it has sufficiently cooled.
- 🔧 **pH:** The pH of the wastewater must be between 5 and 9. Depending on how a brewer cleans and disinfects equipment, brewery wastewater will likely require pH adjustment in order to fit into this range. Holding wastewater in a day tank to allow measurement and pH adjustment prior to discharge is recommended.
- 🔧 **Solids:** All solids must be capable of passing through a 3/8" sieve. Settleable solids shall be removed and install 1/4" screens on all floor drains and trench drains.
- 🔧 **Monitoring Point:** A monitoring point must be easily accessible by City Staff in order to collect samples that represent discharge from the brewing operation in a location that is separate from sanitary and restaurant drains. See Figure 1.

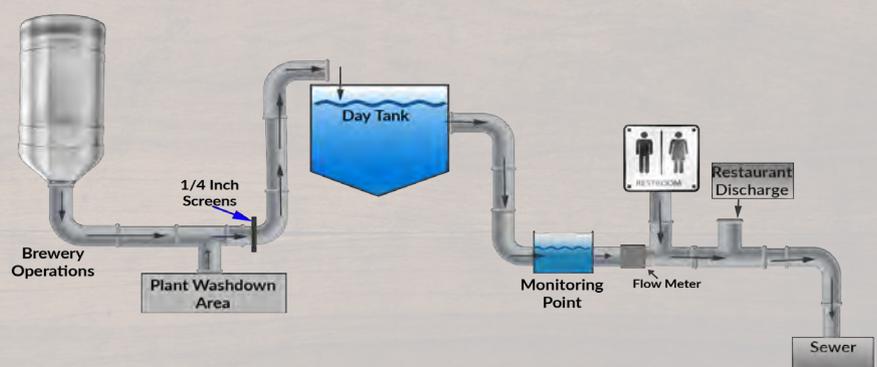


Figure 1: Monitoring Point

Best Management Practices

The following Best Management Practices (BMPs) are recommendations to help breweries reduce the strength of their wastewater – and their corresponding High Strength Surcharge bill.

Solids Management

- Control solids at the source – avoid rinsing them down the drains. Prevent spent yeast, grains, hops, and trub from entering the sewer.
- Sweep or squeegee the floor instead of using water – dispose of collected materials in the trash instead of down the drain.
- Install ¼” screens, filters or baskets on all floor drains and trenches to capture solids – make them easy to access and clean daily.

Side Streaming

- Separating high strength, concentrated wastes at the source and setting them aside for disposal can have a dramatic effect on lowering the High-Strength Surcharge. Effluent from fermentation and filtration typically account for only 3% of wastewater volume but as much as 97% of the BOD₅ load.
- Collect spent yeast slurry from the bottom of fermentation tanks for offsite disposal – it has high nutrient and solids content and can lead to organic acid formation which lowers pH.
- Collect all brewery wastewater in a day tank and dewater collected settleable solids and dispose of off-site.
- Collect beer in hoses/pipes at the beginning/end of a run as well as returned beer in kegs in a separate tank.
- Disposal options for high-strength side streams include: compost, fertilizer, animal feed, and energy production in anaerobic digesters.

Control pH

- Collect all brewery wastewater in the day tank. At the end of the day, measure pH and adjust as needed prior to slowly discharging to the City sewer.
- For small batches with slight excursions above pH 12, mild acids such as acetic acid (vinegar) can be used for neutralization, or mix with low pH waste to neutralize.
- For small batches with slight excursions below pH 5, mild alkaline solutions such as calcium carbonate can be used for neutralization, or mix with high pH waste to neutralize.

Facility Layout Considerations

- All drains from brewing operations should lead to a common drain, sump, and the day tank.
- Set aside sufficient floor space for the day tank and solids handling equipment and storage.
- Provide an easily accessible sample site that is representative of the discharge from the brewing operation, separate from sanitary and restaurant drains – see Figure 1.
- Consider holding all brewery wastewater in the day tank – at the end of the day the pH can be measured and adjusted prior to slowly discharging to the City sewer. This tank might also be a good sampling location for the City. Slowly discharging wastewater during the night-time hours reduces loading on the City’s wastewater treatment plant.
- Consider the method used to measure wastewater discharge volume from the brewing operation – either a flow meter on the wastewater or the water consumption meter.
- Consider installing a separate set of equipment drains (separate from floor drains) in order to collect specific high-strength waste products for offsite disposal.

For additional information, please contact the
City of Kennewick Pretreatment Specialist at (509) 585-4483