



# Delegated Agency Training February 10, 2025 by Raymond Morgan, PE & Michael Stidham, VP of EZ-Treat

## How to Design & Review an Onsite Wastewater Treatment Facility for a Truck Stop with a Restaurant - Part 1



Clean Air, Safe Water,  
Healthy Land for Everyone





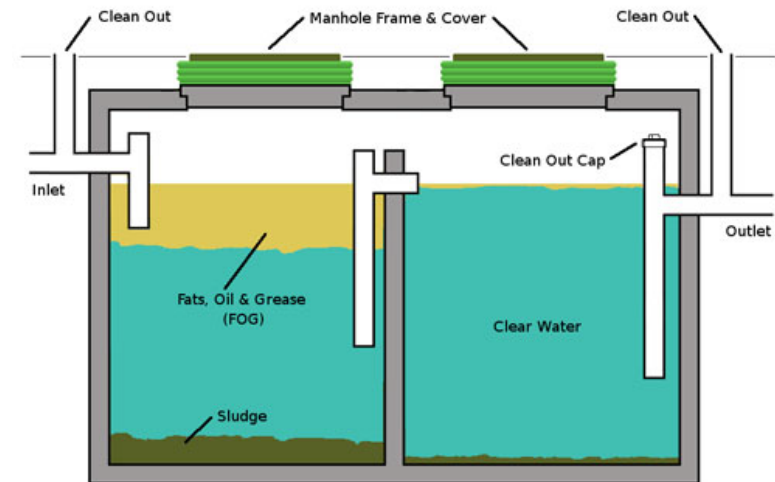
# Administrative Code Review

- R18-9-A309.A.7** A person shall design and operate the permitted on-site wastewater treatment facility so that:
- a. Flows to the facility **consist of typical sewage** and do not include any motor oil, gasoline, paint, varnish, solvent, pesticide, fertilizer, or other material not generally associated with toilet flushing, food preparation, laundry, or personal hygiene;
  - b. Flows to the facility from commercial operations do not contain hazardous wastes as defined under A.R.S. § 49921(5) or hazardous substances;
  - c. **If the sewage contains a component of nonresidential flow such as food preparation, laundry service, or other source, the sewage is adequately pretreated by an interceptor that complies with R18-9-A315** or another device authorized by a general permit or approved by the Department under R18-9-A312(G);

- d. Except as provided in subsection (A)(7)(c), **a sewage flow that does not meet the numerical levels for typical sewage is adequately pretreated to meet the numerical levels** before entry into an on-site wastewater treatment facility authorized by this Article;
- e. Flow to the facility does not exceed the design flow specified in the Discharge Authorization;
- f. The facility does not create an unsanitary condition or environmental nuisance, or cause or contribute to a violation of either a Aquifer Water Quality Standard or a Surface Water Quality Standard; and
- g. **Activities at the site do not adversely affect the operation of the facility.**

Some activities that would adversely affect the operation of an onsite wastewater treatment facility (OWTF). The discharge of wastewater containing the following products to the OWTF.

- Discharge of a water softener (heavy salts – antibacterial agent) to the OWTF
- Use of a grease emulsifier to minimize grease trap cleaning frequency
- Use of Quaternary Ammonium to disinfect counters, tables, cooking areas, and floors (antibacterial agent)



48. “**Typical sewage**” means sewage conveyed to an on-site wastewater treatment facility in which the total suspended solids (TSS) content does not exceed 430 mg/l, **the five-day biochemical oxygen demand (BOD<sub>5</sub>) does not exceed 380 mg/l**, the total nitrogen does not exceed 53 mg/l, and the content of oil and grease does not exceed 75 mg/l.

## **R18-9-A312. Facility Design for Type 4 On-site Wastewater Treatment Facilities**

**A. General design requirements.** An applicant shall ensure that the person designing an on-site wastewater treatment facility:

1. Signs the design documents submitted as part of the Notice of Intent to Discharge to obtain a Construction Authorization, including plans, specifications, drawings, reports, and calculations; and
2. **Locates and designs the on-site wastewater treatment facility project using good design judgment and relies on appropriate design methods and calculations.**

# Design Example





## Design Summary:

Design Flow – 19,496 gpd ADWF; 24,370 gpd PDWF

BOD<sub>5</sub> – 876 mg/l (178 # @ 24,370 gpd)

TN – 74 mg/l (15# @ 24,370 gpd)

Soil – Loam; Moderate Structure

SAR – 0.60 gpd/sf

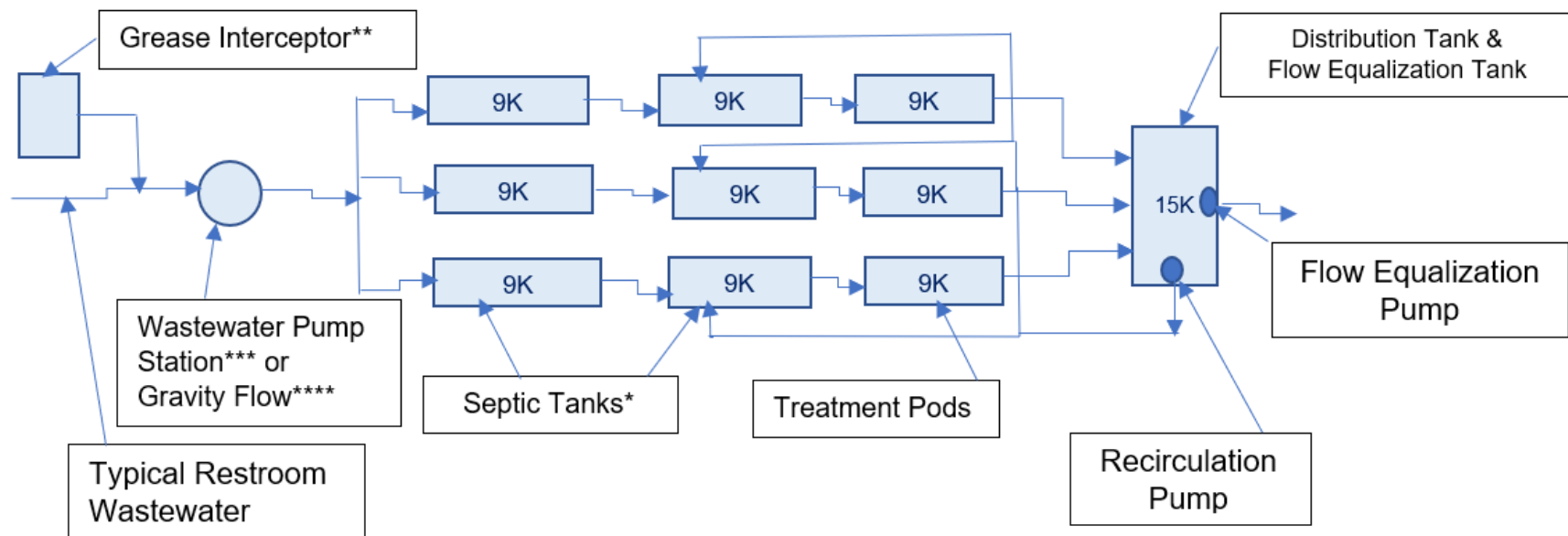
SAR<sub>a</sub> – 1.29 gpd/sf

In developing our design of an OWTF for a truck stop with a restaurant, we need to keep in mind that we will be using three different wastewater flows. I have defined those flows as follows:

- Design flow in terms of the average daily flow. Signified by ADWF
- Design flow in terms of peak flows (Peaking Factor of 1.25) to account for unusually high business volume during the day, the weekends, or holidays. Signified by PDWF
- Treatment capacity flow in terms of what wastewater flows the treatment equipment can process to produce a given quality of effluent. Signified by TCF



# Design Summary – Pretreatment Flow Chart



\*Septic Tanks with a baffle and a septic tank filter. A water spigot located next to each septic tank is preferred to make it easier to periodically clean the septic tank filter.

\*\*Grease Interceptor with a grease trap|filter

\*\*\*If a Wastewater Pumping Station is used, a grinder pump should be avoided, if possible, to improve the treatment performance of the downstream septic tanks.

\*\*\*\*For Gravity Flow to work, the downstream tanks will probably have to be buried deeper.

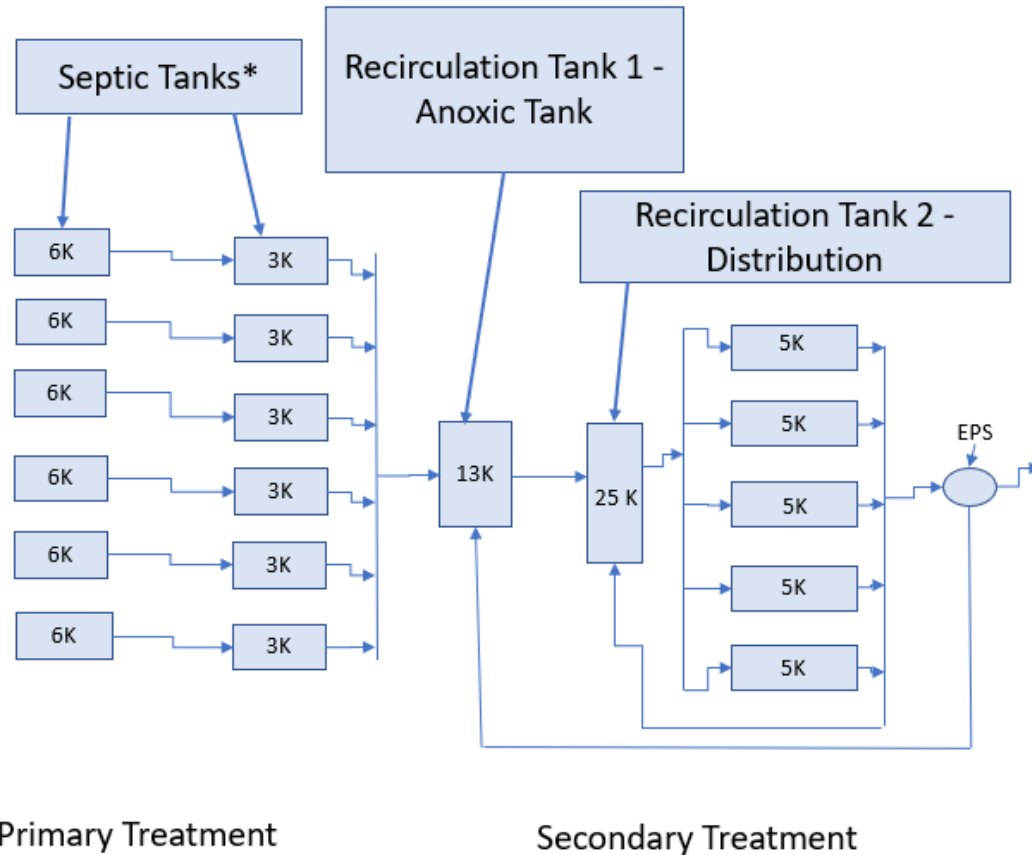
## Pretreatment

# Design Summary – Pretreatment Flow Chart



# Design Summary – Final Treatment Flow Chart

Pretreatment – See  
Previous Flow Chart



\*Each septic tank has a septic tank filter installed at the outlet

## Final Treatment

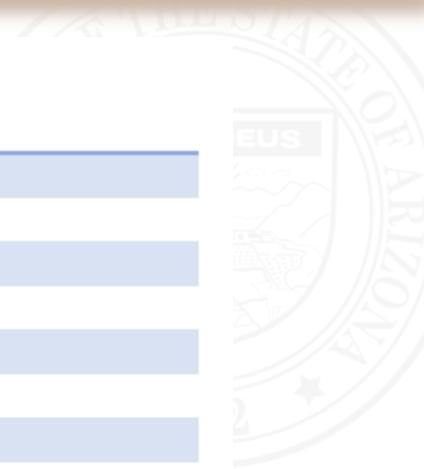
# Design Summary – Final Treatment Flow Chart



# Restaurant Wastewater BOD5 Concentrations



# Restaurant Wastewater BOD5 Concentrations



**Table 2**  
**BOD<sub>5</sub> (mg/L)**

**pH**

<b>Soda</b>	Up to 79 500	2.4
<b>Beer</b>	Up to 80 000	
<b>Whole milk</b>	104 600	
<b>Skim milk</b>	67 000	
<b>Orange juice</b>	7.85 lb/100 lb	
<b>Potatoes</b>	4.20 lb/ 100 lb	
<b>Potato chips</b>	1.25 lb/ 100 lb	

Ref: Carawan, R.E., NC State University, Water and Wastewater Management in Food Processing (1979)

Restaurant type	Average BOD (mg/l)
Fast Food	2,137
Pizza	1,856
Chinese	1,364
Mexican	1,254
American	1,063
American Buffet	792
Steakhouse	601
Seafood	555

Source: 2013 Study conducted by the Harris County Public Infrastructure Department in Texas



## Texas Restaurant Wastewater Analysis, 2003

- Pretreatment is necessary to prevent system failure
- Highlighted the need for a design manual for restaurants

Parameter	Typical domestic waste (range, mg/L)	Restaurant waste (average, mg/L)
BOD	100-400	1,202
COD	100-300	1,717
TSS	100-350	318
FOG	16-65	131

Study funded by the Texas Onsite Wastewater Research Council

## Texas Restaurant Wastewater Analysis, 2003

	n	BOD mg/L	COD mg/L	TSS mg/L	FOG mg/L	BOD lbs/day
<b>Hand wash</b>	5	2,617	2,575	366	120	30.5
<b>Commercial Dishwasher</b>	22	1,037	1,912	418	153	36.9

Values shown are averages

## Service Station with Toilet Facilities

- First bay – 1000 gpd
- Each additional bay – 500 gpd
- Total Flow – 14,000 gpd

## Restaurant with Toilet Facilities

- Employees – 6 x 20 gpd/employee = 120 gpd
- Kitchen waste and disposal – 384 meals in 16 hours x 7 gpd/meal = 2,680 gpd
- Customers – 384 x 7 gpd/customer = 3,688 gpd

## Design Flow – Average & Peak Flows

- Average Design Flow (Average Dry Weather Flow [ADWF]) =  
14,000 gpd + 120 gpd + 2,680 + 3,688 gpd = 19,496 gpd
- Peak Design Flow (Peak Dry Weather Flow [PDWF]) using a  
Peaking Factor of 1.25) = 19,496 x 1.25 = 24,370 gpd



# Any Questions?

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