2025 | Sandusky, OH
Onsite Wastewater
Mega-Conference
Clean Water Strategies at the Heart of it All

Ohio Onsite Wastewater Association

Lessons Learned from Commercial Sampling

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Overview

- Why ?
- Where?
- How?
- Results
- Take Aways

The materials being presented represent my own opinion, and do NOT reflect the opinions of NOWRA.

Why Test Commercial Systems?

Proprietary Treatment Technology Registration Commercial Systems

- The Minnesota Pollution Control Agency (MPCA) allows non-engineers to design commercial systems if they use a "registered product" which has gone through a national testing program
- No national testing program for commercial/high strength waste (HSW) systems
- Conditional registration requires "some" data be submitted and then quarterly samples to be obtained until the committee and MPCA remove sampling requirement

→ Governed by local operating permit requirements

www.pca.state.mn.us/sites/default/files/wq-wwists4-95.pdf

Effluent Requirements of MPCA

BOD < 170 mg/L

TSS < 60 mg/L

FOG < 20 mg/L

DIVERSE SAMPLE SECTION

- 4 food service facilities
- 2 Bar and Grills, 1 Brewery, 1 Church camp/retreat cafeteria
- 1 Convenience store
- 1 RV dump station
- Sampled quarterly for 1 year

What Did We Sample For?

- Raw, Settled and Effluent
- State of MN – BOD5, TSS, FOG
- ½ of samples – Soluble BOD, pH, Alkalinity
- Flow
- No systems under a nitrogen requirement currently
- Ammonia, TKN, Nitate+Nitrite (not shown today)

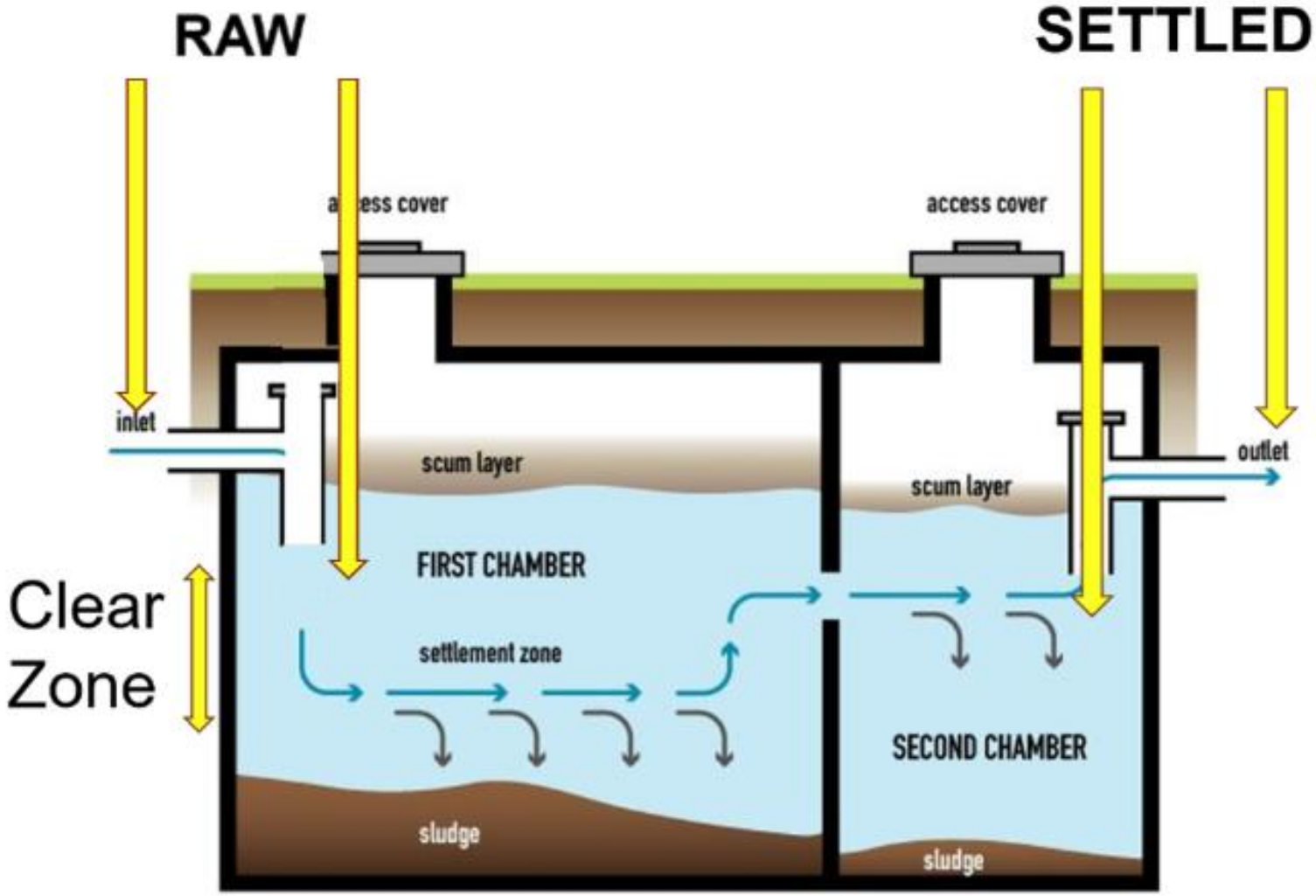
What about cBOD on the Influent?

- cBOD = Carbonaceous BOD
  - Eliminates the nitrogen
- Underestimates the true oxygen demand
- Could result in a 20–40% under design

Lesson #1

- Flow data isn't as easy to collect as I thought.
- All systems had running time clocks and event counters by running draw down tests on the pumps and getting tank information was challenging.

Where to Sample Influent



Lesson #2

Representative Influent Samples are very Difficult to Collect

Getting into the Clear Zone for Raw Samples

Sample collection in this study

- The raw influent samples were collected from the first septic tank in series on the inlet side
- The settled influent samples were collected from the EQ tank- except for one system that did not have an EQ tank then it was taken near effluent screen at outlet of last septic tank
- The effluent samples were collected from the field dosing tank

Swan River Red Eye Saloon

OVERVIEW

- This facility was an existing bar and grill, and a new system was put in with a change in ownership
- The menu proposed during the design process was minimal, consisting of frozen pizzas and other small items

→ That is NOT what happened

TREATMENT TRAIN

System Layout:

NO FLOW EQ

Red Eye

Design flow – 860 gpd

Design BOD5 – 450 mg/L

- Design BOD5 Load: 3.2 lbs./day
- Average BOD5 Load to Ecopod: 8.3 lbs./day

Influent (Raw)

Date	Flow gpd	BOD5 mg/L	TSS mg/L	O&G mg/L
11/9/2022		700	153	92
3/29/2023	428	1130	85	30
7/31/2023	261	1560	405	101
9/11/2023	591	3400	5150	1040
12/13/2023	615	1910	1100	73
4/4/2024		1040	87	41

Settled

Date	Flow gpd	BOD5 mg/L	TSS mg/L	O&G mg/L
11/9/2022		451	135	54
3/29/2023	428	490	45	30
7/31/2023	261	1090	183	101
9/11/2023	591	589	53	1040
12/13/2023	615	533	60	73
4/4/2024		682	124	16

Effluent

Date	BOD5 mg/L	TSS mg/L	O&G mg/L
11/9/2022	61	103	<5
3/29/2023	28	70	<5
7/31/2023	<20	11	<5
9/11/2023	14	12	6
12/13/2023	53	40	5
4/4/2024	6	6	<5

Red Eye Takeaways

- On the initial site visit it was noted that the system did not appear to have had any maintenance for some time, owner has no service contract
- The food service included burgers, fries, and other bar and grill fare but also broasted chicken every weekend and a fish fry one Friday a month
- This type of menu would be expected to produce a much higher influent BOD5 than was estimated.
- High TSS values likely due to lack of flow eq

North 20 Brewery

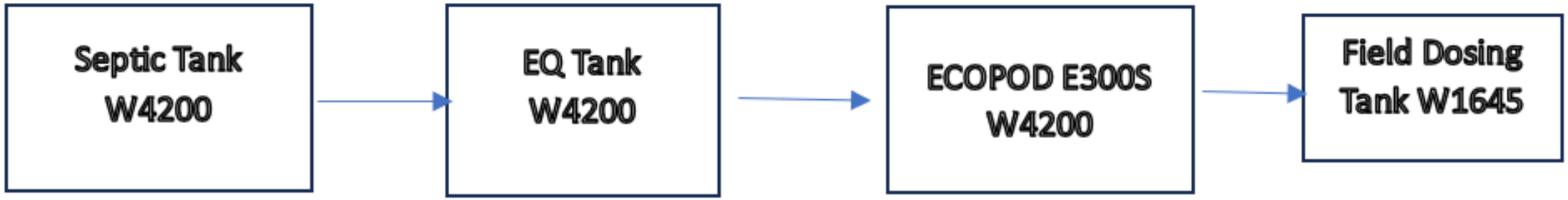
OVERVIEW

- New taproom with minimal food
- The menu proposed during the design process was minimal

  → That is NOT what happened

SOAP ISSUES

System Layout:



North 20 Brewery

Design Flow - 1,570 gpd

Design BOD5 - 400 mg/L

- Design BOD5 Load: 5 lbs./day
- Average BOD5 Load to Ecopod: 7.1 lbs/day

Results

Influent (Raw)

Date	Flow gpd	BOD5 mg/L	TSS mg/L	O&G mg/L
3/27/2023	3046	1090	115	102
6/19/2023	643	1600	50	11
9/20/2023	653	1360	70	6
12/21/2023	1218	1210	63	17
3/25/24		1560	140	30

Influent (Settled)

Date	BOD5 mg/L	TSS mg/L	O&G mg/L
3/27/2023	136	45	5
6/19/2023	1520	183	7
9/20/2023	1340	53	10
12/21/2023	590	60	11
3/25/2024	736	124	6

Effluent

Date	BOD5 mg/L	TSS mg/L	O&G mg/L
3/27/2023	58	15	6
6/19/2023	56	38	<5
9/20/2023	22	42	<5
12/21/2023	<20	10	<22
3/25/24	44	28	<5

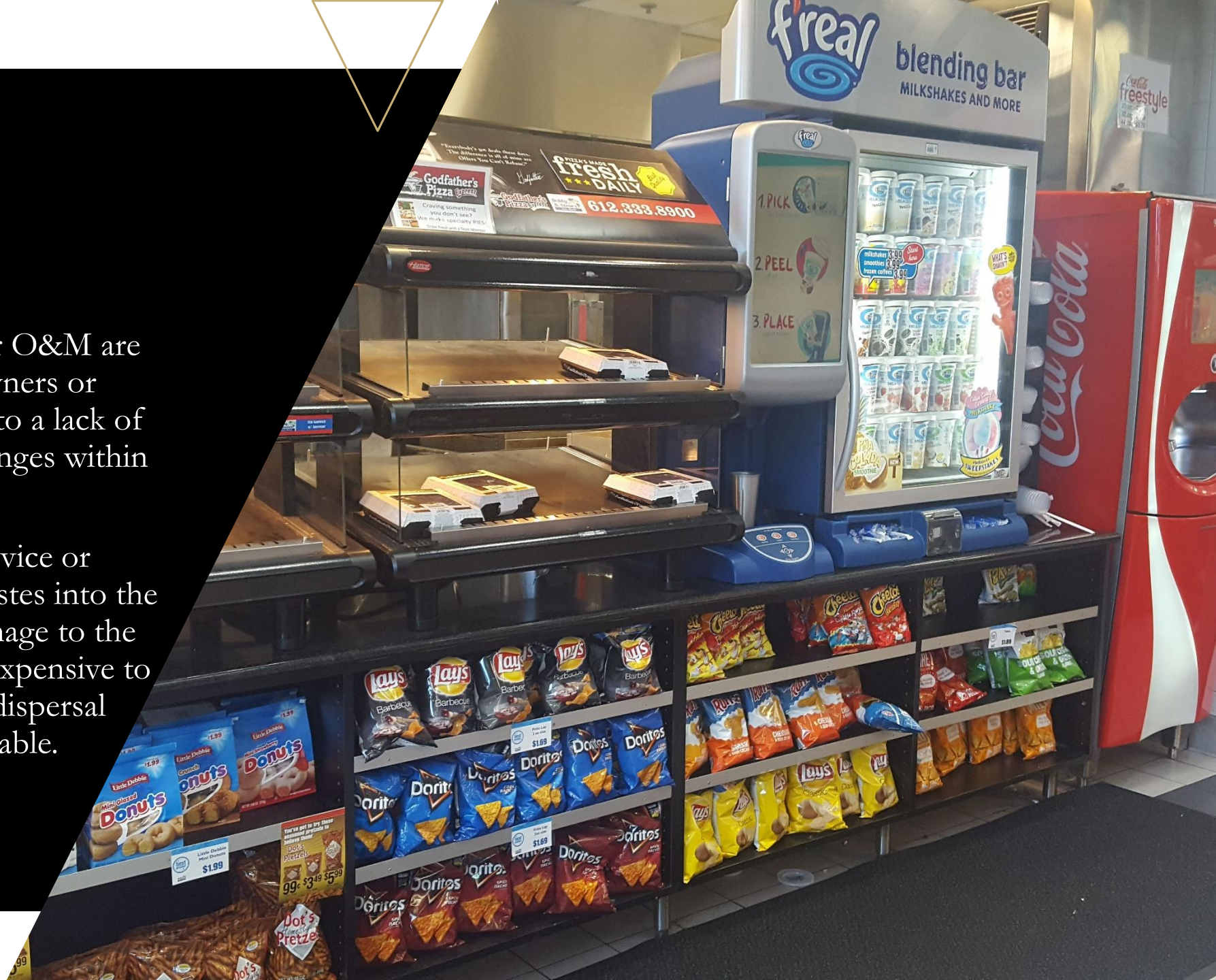
North 20 Takeaways

- The ECOPOD unit did not have the influent dosing line plumbed into the distribution line over the media
- Appeared that brewery waste was entering the system vs holding tank
- No service contract
- Since opening, the facility has expanded their food service somewhat to include smash burgers on some Friday nights
- Regularly host events
- Flow eq tank was always empty when sampling occurred except after a holiday event
- Excessive foaming has indicated an overuse of cleaning products

Excessive Soap Usage

Lesson #3

- System design and the need for O&M are either not fully explained to owners or ignored by the owners leading to a lack of service and/or operational changes within the facility.
- Examples: expanding food service or disposing of industrial type wastes into the system, potentially causing damage to the treatment system that may be expensive to correct and/or damage to the dispersal systems which could be irreparable.

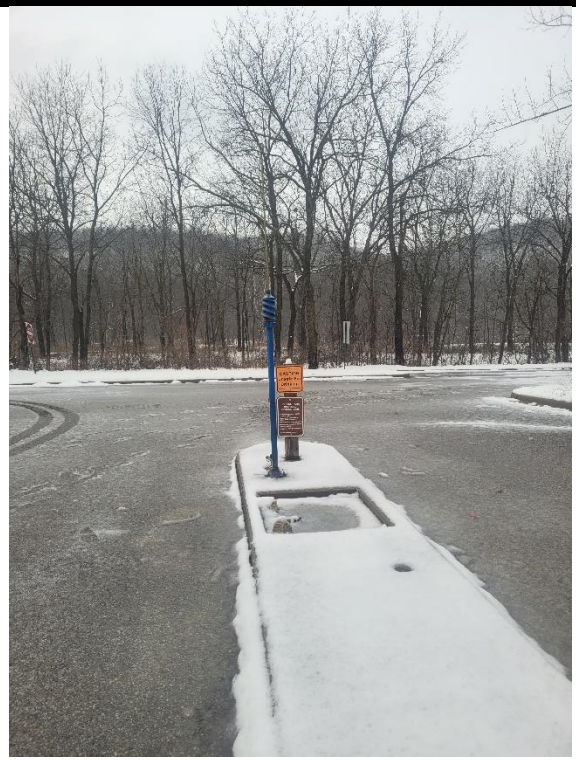


Whitewater State Park

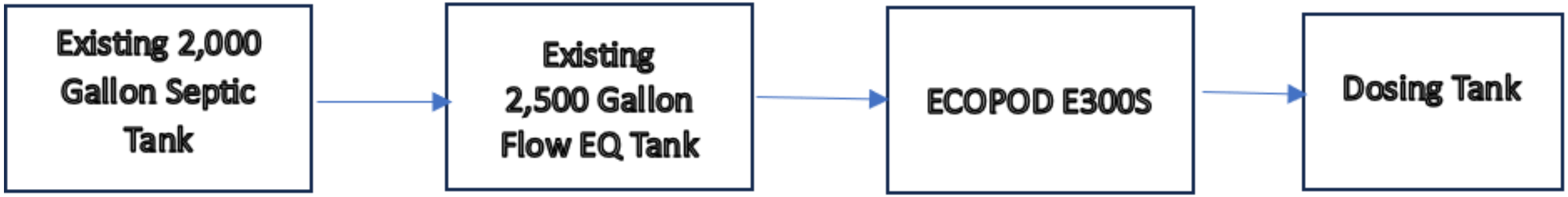
OVERVIEW

- RV dump station waste only
- Existing ATU was upgrade as previous one broke due to lack of maintenance

DUMP STATION



System Layout:



Whitewater State Park RV Dump Station

Design flow – 800 gpd

Design BOD5 – 900 mg/L

- Design BOD5 Load: 3.2 lbs./day
- Average BOD5 Load to Ecopod: 11.6 lbs./day

Results

Influent (Raw)

Date	Flow gpd	BOD5 mg/L	TSS mg/L	O&G mg/L
3/27/2023	225	3000	140	51
6/19/2023	451	2520	225	21
9/20/2023	1192	1970	215	24
12/21/2023	431	2560	230	20
3/25/2024		4340	235	21

Influent (Settled)

Date	BOD5 mg/L	TSS mg/L	O&G mg/L
3/27/2023	504	55	6
6/19/2023	2080	260	31
9/20/2023	1580	180	22
12/21/2023	218	43	13
3/25/2024	330	70	7

Effluent

Date	BOD5 mg/L	TSS mg/L	O&G mg/L
3/27/2023	25	10	<5
6/19/2023	Blower Off - No Sample		
9/20/2023	34	33	<5
12/21/2023	39	30	6
3/25/24	6	10	<5

Whitewater Takeaways

- The ECOPOD unit did not have the influent dosing line plumbed into the distribution line over the media
- No service contract
- The settled influent BOD5 values were not consistent and did not seem to accurately represent the influent on all sampling occasions
- The raw influent was more consistent
- The resulting average load on the system was almost twice what was expected, and just over 150% of the maximum capacity of the system at 11.6 lbs./day

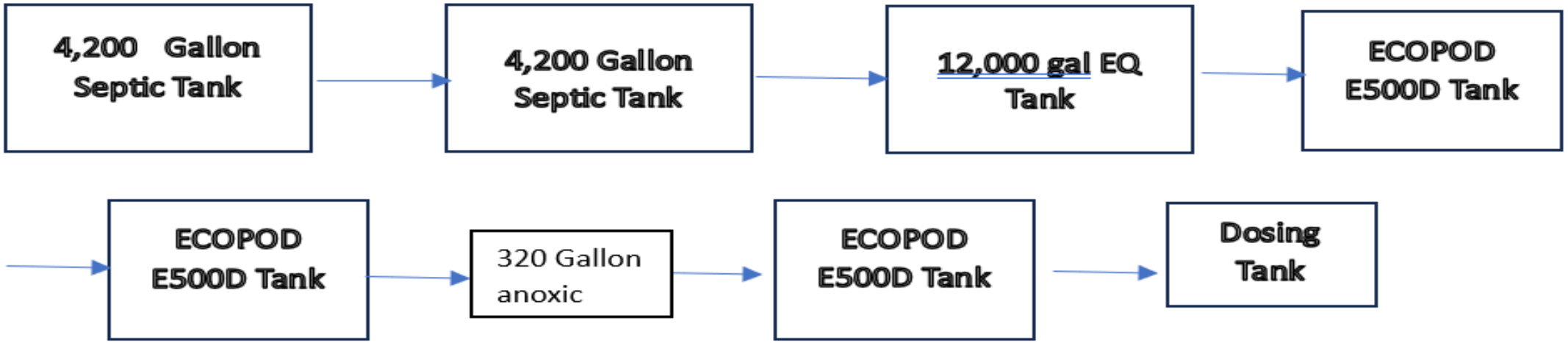
Shakopee Bowl

OVERVIEW

- Bar/Restaurant with bowling, concerts, volleyball and tee ball courts/fields
- System was installed due to expansion

PACKED LOCATION!

System Layout:



Shakopee Bowl

Design flow – 4019 gpd
Design BOD5 – 452 mg/L

- Design BOD5 Load: 10.7 lbs./day
- Average BOD5 Load to Ecopod: 12.9 lbs./day

Results

Influent (Raw)

Date	Flow gpd	BOD5 mg/L	TSS mg/L	O&G mg/L
6/28/2023		593	72	72
9/20/2023	1937	1150	103	103
12/21/2023	2040	584	105	105
3/25/2024		1510	650	650

Influent (Settled)

Date	BOD5 mg/L	TSS mg/L	O&G mg/L
6/28/2023	335	75	16
9/20/2023	550	100	16
12/21/2023	439	63	14
3/25/2024	604	53	14

Effluent

Date	BOD5 mg/L	TSS mg/l	O&G mg/L
6/28/2023	3	7	<5
9/20/2023	<6	9	<5
12/21/2023	23	26	<5
3/25/2024	46	18	7

Lesson #4

The flow determination for most new system designs is conservative

This can provide a buffer in some cases when the strength of the wastewater is higher than anticipated, although may also lead to unnecessary upfront costs in sizing systems

Shakopee Bowl Takeaways

- The lids were sealed due to odor concerns and the first lid in the system was not able to be removed at all
- The blower pressure relief valve was open too far and was adjusted to deliver more air to the system.
- Fence was installed limiting access for maintenance
- Finishing/landscaping really would benefit the system

Bill's Superette

OVERVIEW

- This facility was existing convenience store and was expanding their building
- Expected loading was at the unit's maximum capacity

BIG CONVENIENCE STORE

Existing 1,500 Gallon Septic Tank → Existing 1,500 Gallon Tank – Converted to EQ → ECOPOD E200S → Existing 2,000 Gallon Field Dosing Tank

Bill Superette

Design flow – 1000 gpd
Design BOD5 – 600 mg/L

- Design BOD5 Load: 5 lbs./day
- Average BOD5 Load to Ecopod: 3.8 lbs./day

Results

Influent (Raw)

Date	Flow gpd	BOD5 mg/L	TSS mg/L	O&G mg/L
11/9/2022	Sample not taken			
3/29/2023	877	1700	85	22
7/5/2023	858	548	296	10
9/11/2023	772	480	133	22
12/5/2023	754	System pumped day before		
12/13/2023		638	123	11
3/28/2024		1110	77	13

Influent (Settled)

Date	BOD5 mg/L	TSS mg/L	O&G mg/L
11/9/2022	396	135	51
3/29/2023	741	133	33
7/5/2023	459	137	20
9/11/2023	490	90	20
12/5/2023	System pumped day before		
12/13/2023	540	147	38
3/28/2024	357	83	26

Effluent

Date	BOD5 mg/L	TSS mg/l	O&G mg/L
11/9/2022	14	22	<5
3/29/2023	63	50	<5
7/5/2023	27	18	<5
9/11/2023	14	18	<5
12/5/2023	System pumped day before		
12/13/2023	67	70	6
3/28/2024	17	16	<5

Lesson #5

- Influent/settled waste strength varied – 1 sample is NOT enough

Bill's Takeaways

- On the initial visit it was noted that the growth on the media was filamentous in nature and there was an accumulation of a thick black sludge, typically associated with that type of bacteria, floating outside the reactor box in the ECOPOD tank and covering other appurtenances in that tank and the pump tank.
- The air filter on the unit was also clogged with grass clippings and the blower aeration was noticeably improved once that was corrected.
- This is a very large gas station where you can buy your groceries for the week with some food preparation
- One TSS sample did not pass likely due to filamentous bacteria and/or incorrect pumping

Lesson #6

SAMPLING IN WINTER IS NOT AS MUCH FUN!

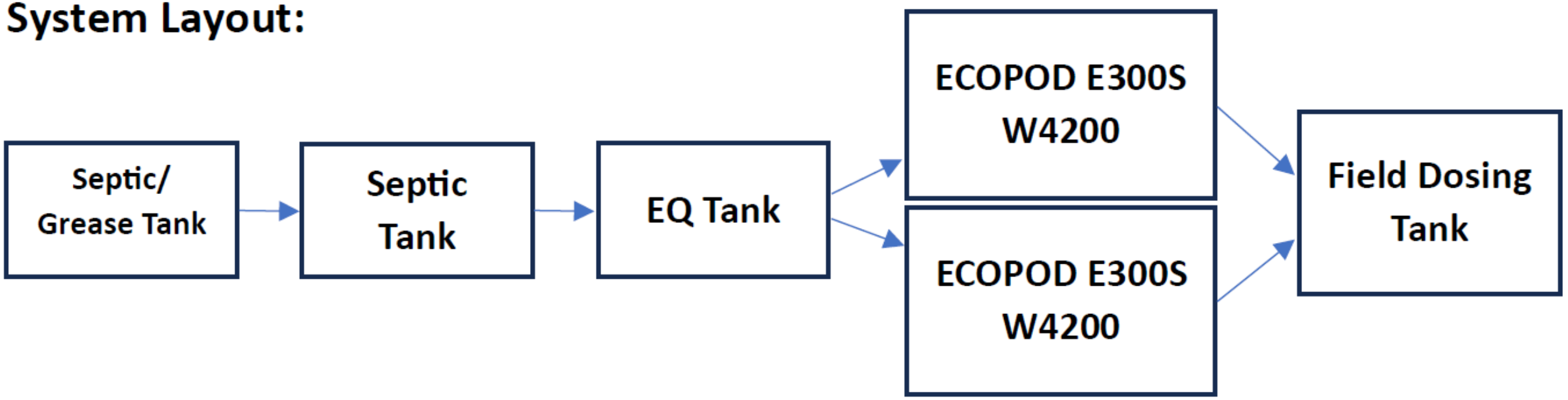
Koronis Conference and Retreat Center

OVERVIEW

- System installed treat wastewater from the tabernacle restrooms and the new cafeteria placed in the tabernacle basement
- The food service was described as typical cafeteria food and was expected to be similar to a school food service operation
- Host weddings and other events

LARGE EVENT CENTER

System Layout:



Koronis Conference and Retreat Center

Design flow – 3,800 gpd

Design BOD5 – 509 mg/L

- Design BOD5 Load: 12 lbs./day
- Average BOD5 Load to Ecopod: 4.2 lbs./day

Results

Influent (Raw)

Date	Flow gpd	BOD5 mg/L	TSS mg/L	O&G mg/L
6/27/2023	803	857	135	42
9/12/2023	708	1520	290	72
3/24/2024		365	35	6

Influent (Settled)

Date	BOD5 mg/L	TSS mg/L	O&G mg/L
6/27/2023	968	115	30
9/12/2023	706	247	21
3/24/2024	192	75	10

Effluent

Date	BOD5 mg/L	TSS mg/l	O&G mg/L
6/27/2023	7	5	<5
9/12/2023	30	28	7
3/24/2024	20	25	<5

Koronis Takeaways

- The raw influent BOD5 started to increase as the season progressed, which would seem to indicate residual buildup in the first tank
- The settled influent BOD5 values collected were more consistent and averaged 837 mg/L, therefore, the settled influent values were used to evaluate the loading on the system
- System backed up due to the inlet baffle extending down to almost the bottom of the tank – it appears this tank IS designed as a grease interceptor, but it is taking all of the flow and may be an ongoing issue
- Aeration unit was shut off in December even though there would be events in the winter – discussion had with owner

Lesson #7

- Each facility produced a unique wastewater that reacted differently to pretreatment by a septic tank
- No set value in BOD5 removal in a septic tank of any size can be expected without considering the wastewater generated by the facility.

SUMMARY

- 99.9 % of systems met HSW parameters on at least one influent parameter
- 4 locations routinely exceeded approved design capacity of the units for BOD
- 5 out of the 6 were above 70% of design loading for BOD
- No system has a true grease interceptor
- 84 total effluent samples taken for BOD/TSS/O&G
- 96 % effluent samples passed MPCA requirements
  - TSS was exceeded on 3 samples
- Only 2 Systems had known O&M providers during testing (required too!)
  - Bill's Superette and Koronis
  - Shakopee Bowl

Lesson #8

- O&M plans are not always followed or enforced and getting your hands dirty is a GOOD idea!

Thank You

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