

# Reuse Comes to On-Site Systems A Success for One Family

2020 Onsite Wastewater

Mega Conference

By

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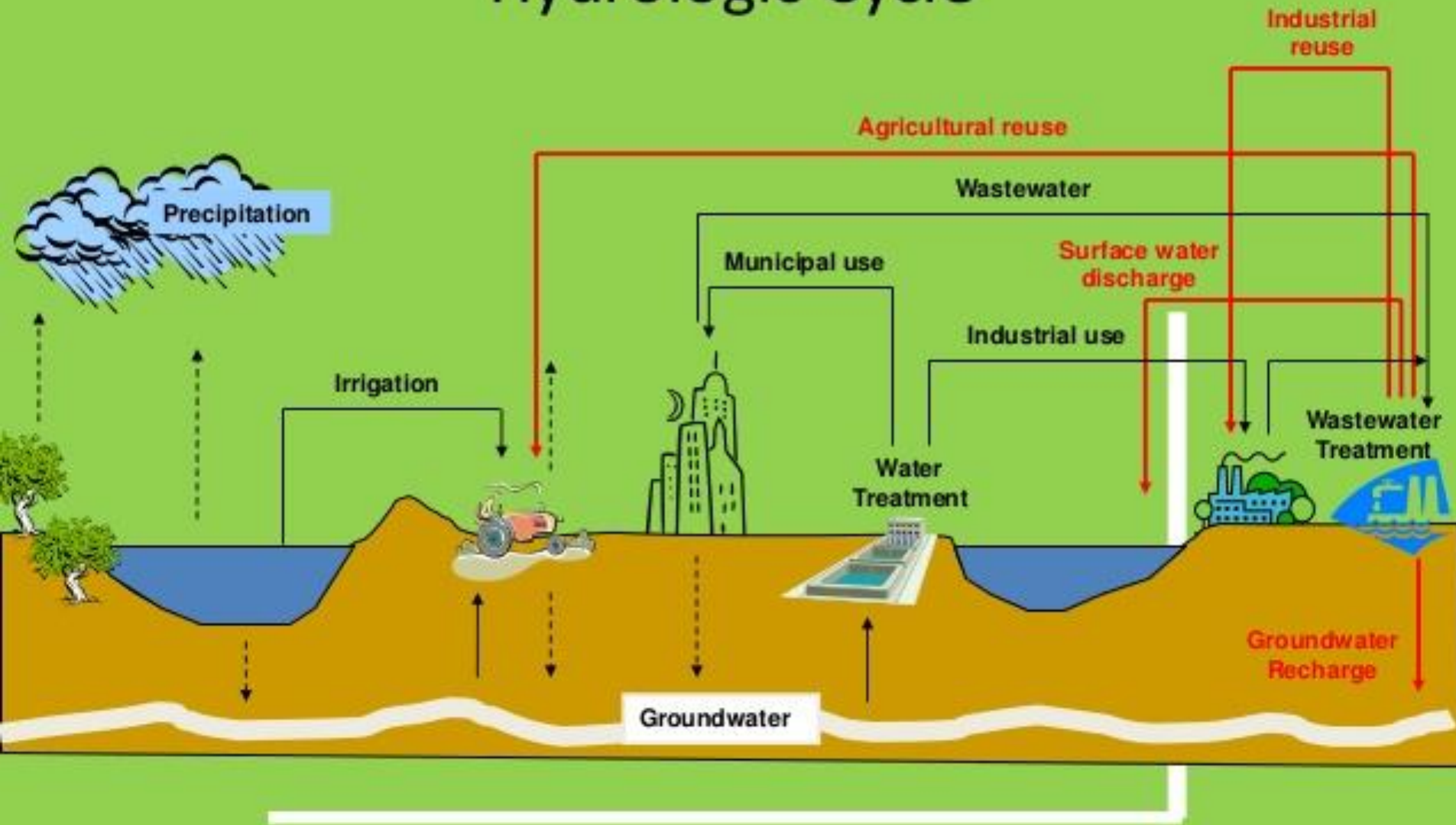
# What is Reuse Water?

- Wastewater Treatment at a Level Where Water can be Used in a Beneficial Way.
- Protected Human Health.
- Environmentally Sound.
- Profitability is Desirable .



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# Wastewater Reclamation & Reuse and the Hydrologic Cycle

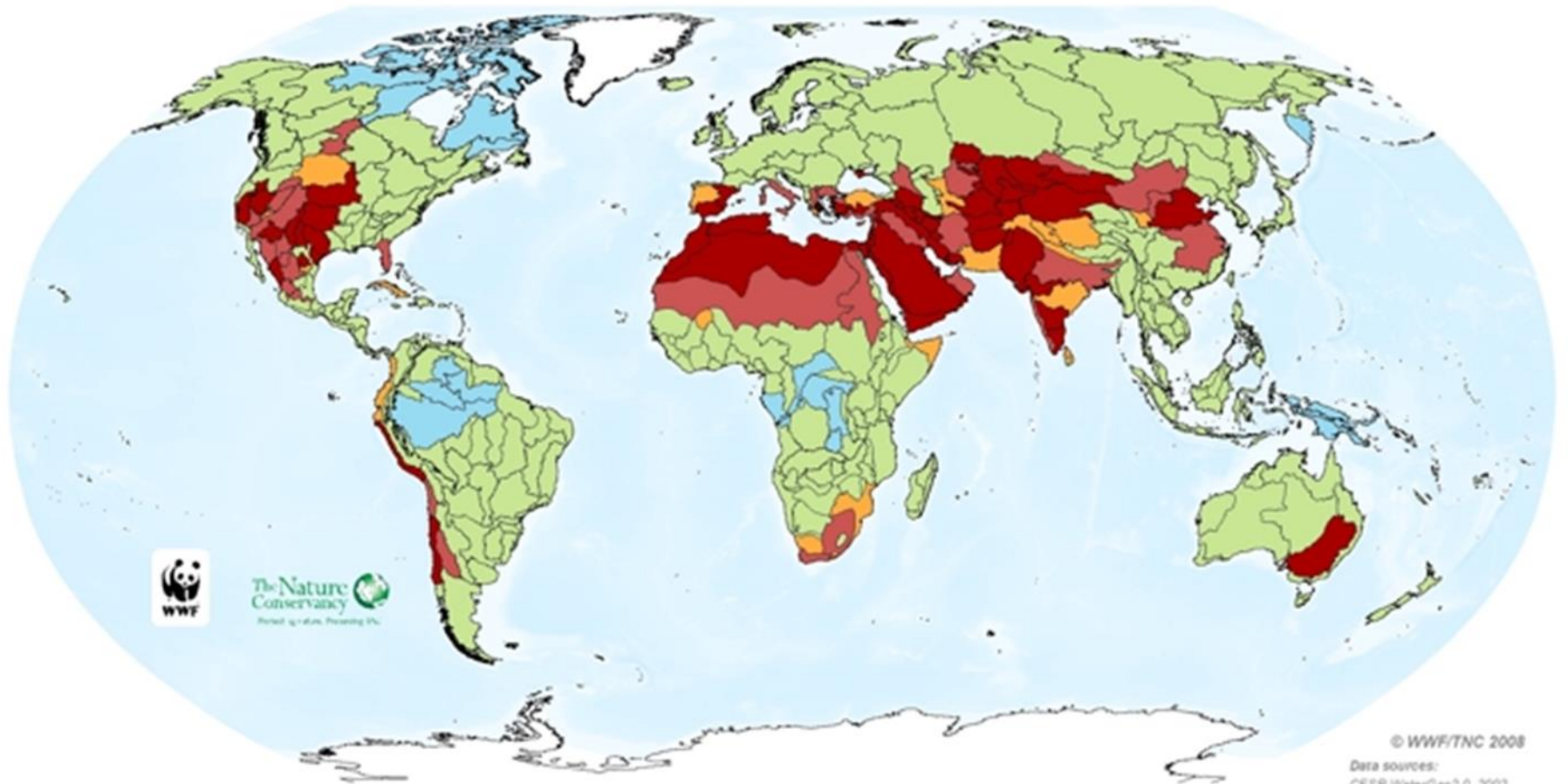


# Why Do We Need Water Reuse?

- > 97% of Earth's Water is Salty.
- +/- 2% is Snow and Ice.
- Leaves +/- 1% for Crops, for Industrial Processes, Beverages, Bathrooms, Kitchens, Etc.
- Quality of Fresh Water is Often Not Adequate.
- The Demand for Water often Exceeds the Water Supply.



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The Nature Conservancy  
 Protect. Restore. Promote.™

© WWF/TNC 2008

Data sources:  
 CESR WaterGap 2.0, 2002  
 Abell et al. 2008  
 www.fao.org

Water use stress

- |   |   |
|---|---|
|  Minimal use |  Moderate stress |
|  No stress   |  Stress          |
|   |  High stress     |





2013/03/31







05/07/2010

# Benefits of Using Reuse Water

- Reduces Demand on Potable Water & Treatment Demands.
- Provides Options for Treated Wastewater.
- Often, the Most Cost-Effective Method for Water/Wastewater Options.
- Trace Nutrients and Minerals can Provide Agronomic Benefits.



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# Applications for Reuse Water

- Irrigation of Crops, Landscapes, Golf Courses, Forests, etc.
- Cooling Water - Process.
- Non-Food Industrial Water.
- Odorless with Discharge.
- Car Wash.
- Construction (dust control). Other.



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# Municipal WWTP - Reuse

- Many Successful Stories.
- Proven Technologies.
- Economies of Scale.
- Regulations for Reuse.
- Often Extra Credit for Competitive Grants.
- Availability of Potable Water.
- Well Established.



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# Historical Barriers to Onsite Low Flow Reuse

- Technologies Limited or Non-Existent.
- High Capital and O&M Costs.
- Regulations for Reuse Aimed at Municipal POTWs Not Small Systems.
- Lack of Standards
- Non-Existent Government Incentives/Assistance (ex. Solar).
- Not Well Established.



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# What Has Changed with Respect to Onsite Small Flows Reuse

- Technologies Now Available.
- High Capital and O&M Costs (Still a Concern).
- Regulations Starting to Address Low Flow Onsite Reuse.
- NSF Now Has Reuse Standards.
- Non-Existent Government Incentives/Assistance (ex. Solar), (Still a Concern).
- Becoming a Viable Option with Challenging Sites.



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# Who Regulates (Standards)?

- Federal Government (USEPA).
- State Government.
- Local Government.
- Independent Standards (NSF/ANSI).



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# Standards NSF / ANSI

Test	NSF/ANSI 40	NSF/ANSI 245	NSF/ANSI 350
	Domestic	Nutrient	Reuse
CBOD 5-Day	25 mg/l		10 mg/l
TSS	30 mg/l		10 mg/l
Nitrogen Reduction		50 % Reduction	
Turbidity			5 NTU
Bacteria (e-coli)			14 CFU/100ml
Chlorine Residual			0.5 - 2.5 mg/l
pH	6 - 9		6 - 9



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# Case History

## Single Family Home – Raleigh, NC

- Lot Located in Upscale Neighborhood.
- Lot Aesthetically Pleasing.
- Poorly Drained Soils – Subsurface Disposal Not an Option.
- Setbacks & Drainage Features – Restricted Conventional Irrigation.
- Reuse with Reduced Setbacks Only Option.



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# Membrane Bioreactor (MBR)

- Activated Sludge Process.
- Small Footprint.
- Combines Functions with a Minimum Number of Basins.
- Robust with Changes in Flows.
- Various Types of Tanks (concrete, steel or plastic) can be Used.
- Reuse Quality Water.



Green Global  
Technologies

# Original System

- NCDENR Permit – September 2014.
- 5-Bedroom Residence (600 GPD).
- Membrane Bioreactor (MBR).
- Irrigated 0.27 Acre of Lawn.



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# Permit Limits

## ATTACHMENT A - LIMITATIONS AND MONITORING REQUIREMENTS PPI 001 - Reclaimed Water Generation System Effluent

Permit Number: WQ0036557 Version: 1.2

1. 3 x Year monitoring shall be conducted in March, July, and November.

EFFLUENT CHARACTERISTICS		EFFLUENT LIMITS					MONITORING REQUIREMENTS <sup>2</sup>	
PCS Code	Parameter Description	Units of Measure	Monthly Average	Monthly Geometric Mean	Daily Minimum	Daily Maximum	Measurement Frequency	Sample Type
00310	BOD, 5-Day (20 °C)	mg/L	10			15	3 x Year <sup>1</sup>	Grab
50060	Chlorine, Total Residual	mg/L					3 x Year <sup>1</sup>	Grab
31616	Coliform, Fecal MF, M-FC Broth, 44.5 °C	#/100 mL		14		25	3 x Year <sup>1</sup>	Grab
50050	Flow, in Conduit or thru Treatment Plant	GPD	600				3 x Year <sup>1</sup>	Estimate
00610	Nitrogen, Ammonia Total (as N)	mg/L	4			6	3 x Year <sup>1</sup>	Grab
00625	Nitrogen, Kjeldahl, Total (as N)	mg/L					3 x Year <sup>1</sup>	Grab
00620	Nitrogen, Nitrate Total (as N)	mg/L					3 x Year <sup>1</sup>	Grab
00600	Nitrogen, Total (as N)	mg/L					3 x Year <sup>1</sup>	Grab
00400	pH	su			6	9	3 x Year <sup>1</sup>	Grab
00665	Phosphorus, Total (as P)	mg/L					3 x Year <sup>1</sup>	Grab
00530	Solids, Total Suspended	mg/L	5			10	3 x Year <sup>1</sup>	Grab
00076	Turbidity, HCH Turbidimeter	NTU				10	3 x Year <sup>1</sup>	Recorder

# Major MBR System Components

- 1,500 Gallon Tank w/ Aerobic & Anoxic/EQ Zones.
- 300 Gallon Tank w/ Aeration & Plate Membrane.
- Pumps – Air Diffuser, Permeate, & Effluent.
- Polishing Cartridge.
- UV – Disinfection.
- 3,500 Gallon (5-Day) Upset Tank.
- 5,000 Gallon Dosing Tank.
- Controls & Instrumentation.



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# Figure 1: 2025 Cadenza Ln.

WQ0036557

**Legend**

-  Property Line
-  Spray Area
-  Spray Zone
-  Treatment Unit





7/ 6/2017



7/ 6/2017





7 / 6 / 2017

# Issues with MBR System

- Did Not Meet Permit Limits.
- Problem w/ Membrane Fouling.
- NCDER – Fix or Replace.
- Manufacturer Tried to Get System to Work.
- Last Option – Replace System.



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# Replace System Considerations

- Use as Much Existing Equipment as Possible.
- Proven Technology.
- Costs.
- Minimize Construction Impacts on Residents.
- Meet Permit Limits.



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# Recirculating Media Filter

- Technology Based on Recirculating Sand Filter.
- Uniform Plastic Media.
- Only Moving Parts are Pumps.
- Simple to Operate and Maintain.
- Expandable, can be Phased.
- Reuse Quality Water.



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# Upgraded System

- NCDENR Permit – February 2018.
- 5-Bedroom Residence (600 GPD).
- Recirculating Media Filter.
- Irrigated 0.27 Acre of Lawn.



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# “Reused” Components

- Tanks.
- Controls.
- Enclosure.
- Irrigation System.



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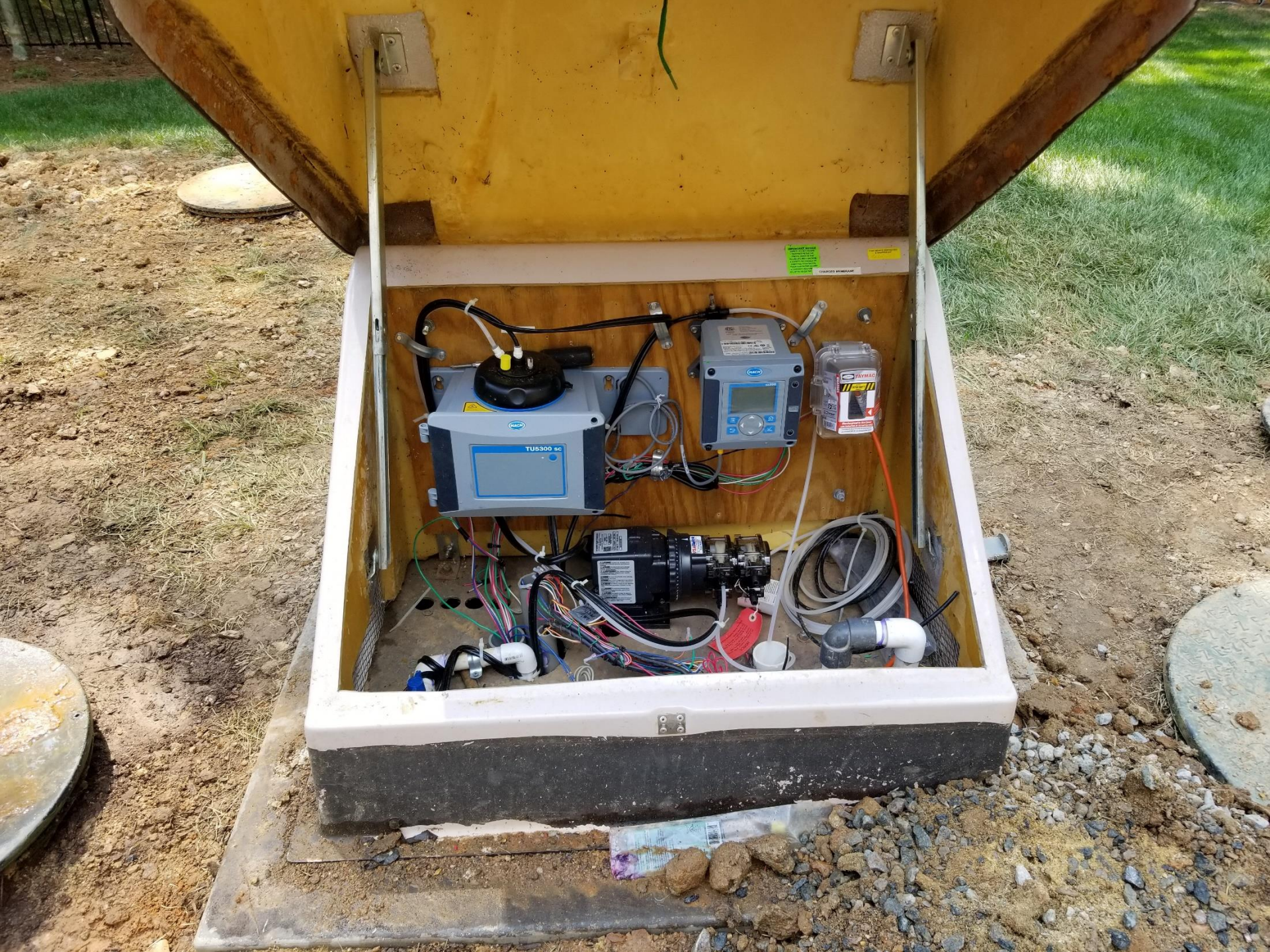








ADDITIONAL  
PARTS INSIDE



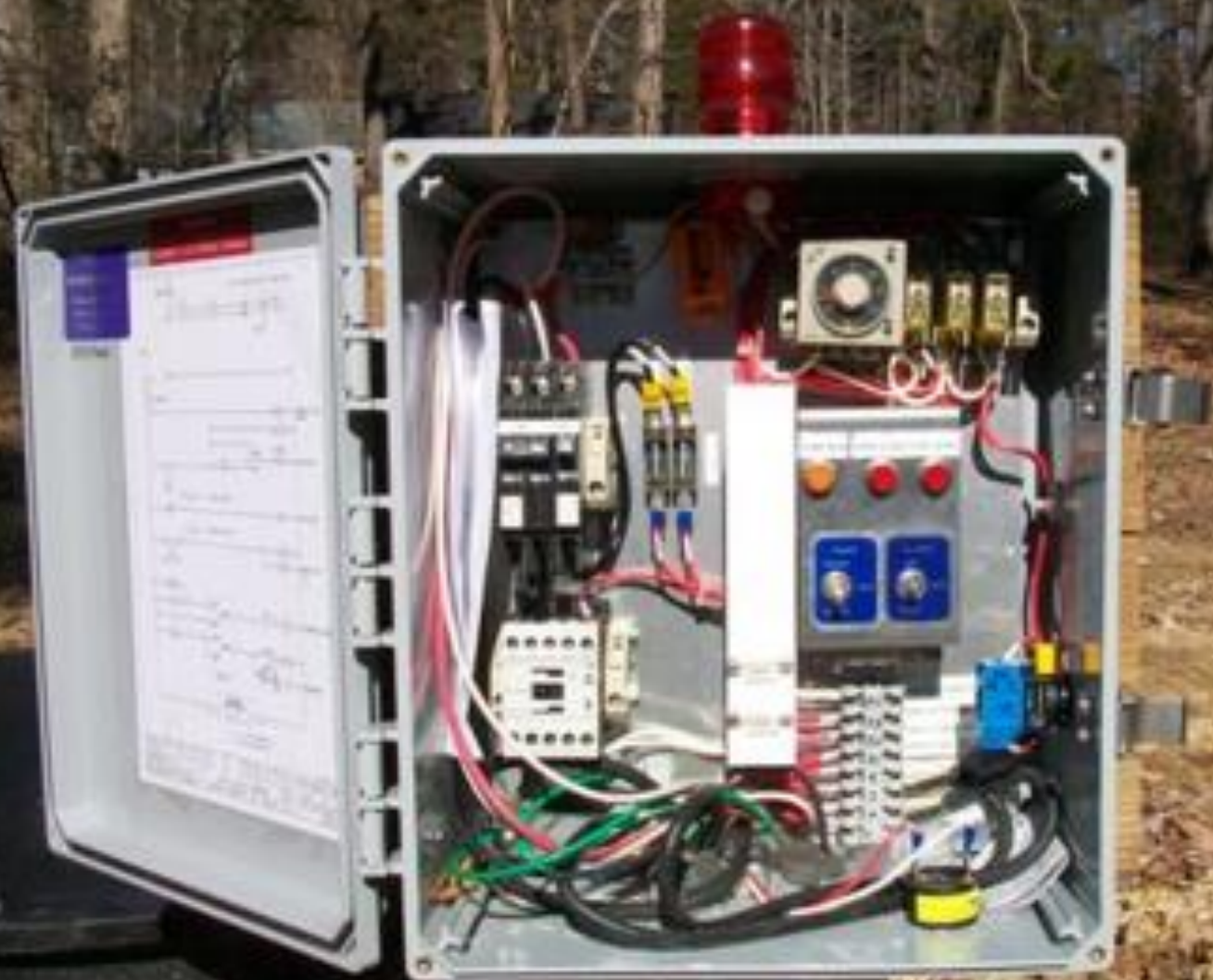
TU5300 SC

RTU  
RTU-5000  
RTU-5000  
RTU-5000

PAYMAC  
PAYMAC  
PAYMAC

1/2 HP  
1/2 HP  
1/2 HP

RTU-5000  
RTU-5000  
RTU-5000



2011/02/11



# Test Results

Parameter	3/18/2019	7/2/2019	11/5/2019	3/4/2020	Average
Turbidity mg/l	3.4	2.3	1.8	0.5	2.0
TSS mg/l	2.5	2.5	5.0	2.7	3.18
BOD (5-Days) mg/l	4.2	2.0	2.0	4.7	3.23
pH	7.0	7.6	7.6	7.8	7.5
Fecal Coliforms MPN/100 ml	1.0	Not Sampled	1.0	1.0	1.0
Chlorine Residual mg/l	5.2	2.3	0.026	Not Sampled	2.5
Ammonia Nitrogen mg/l	3.0	0.1	4.1	2.9	2.53
Kjeldahl – Nitrogen mg/l	4.9	0.5	4.4	3.3	3.28
Nitrate / Nitrite – N mg/l	24.7	2.1	17.3	7.0	12.77
Phosphorus mg/l	8.8	1.0	7.8	7.7	6.33



# Summary

- Recirculating Media Filters can Meet Reuse Requirements.
- Owner and Operator Satisfied with System.
- Cost is Still an Issue.
- Regulations Need to Be Updated to Address Small Onsite Reuse Systems.



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Questions?



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