

MBR Technology for On-site Wastewater Systems

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Membrane BioReactors (MBR)

Membranes: What They Are

- Membranes are thin barriers or films of material that allow certain substances to pass.
- Synthetic membranes are usually 100 to 500 microns thick.
- Membranes that allow only some substances to pass through them are called *semi permeable* membranes.
- Useful membranes can be made from polymers, ceramics, metals, or porous materials impregnated with liquid or gelatin-like substances.

History of Membranes

- Membranes have been used for 100's of years
- Manufactured membranes have been used in industrial applications such as canning, dating back to more than 100 years ago.
- In the 1960's manufactured membranes were first utilized for drinking water purification.
- With improvements in production methods in the 80's and 90's membranes were used in a broader spectrum of applications including Wastewater Treatment
- Today, membranes are one of the primary technologies selected for Decentralized Wastewater Treatment

Type of Membranes

- **Pore Size:**
 - Microfiltration
 - Ultra filtration
 - Nan filtration
 - Reverse Osmosis (RO)
- **Configuration**
 - Flat sheet
 - Hollow fiber

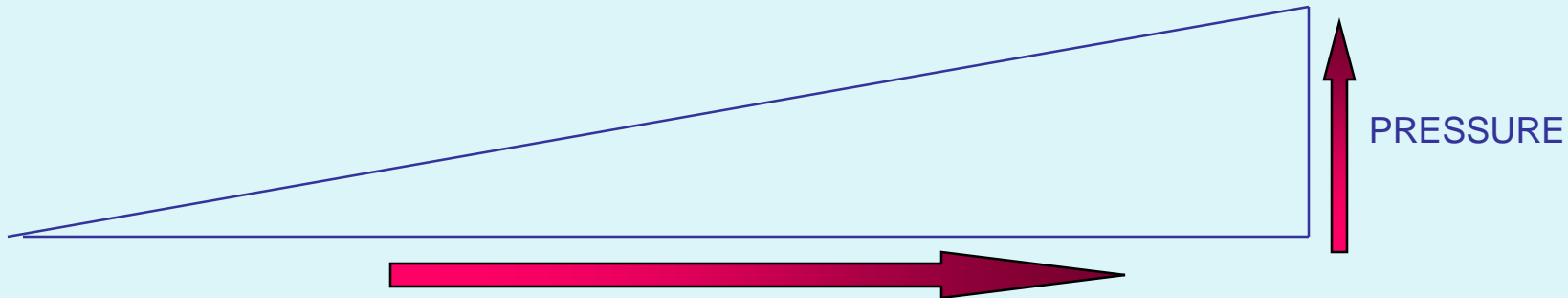
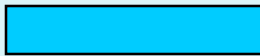
Membrane Spectrum

Microfiltration

Ultra filtration

Nan filtration

Reverse Osmosis



INCREASING TRANSMEMBRANE PRESSURE
DECREASING MEMBRANE OPERATIONAL LIFE

Filtration in the 0.1 micron range is the most widely used membrane type in wastewater treatment applications.

Types of Immersed Membranes



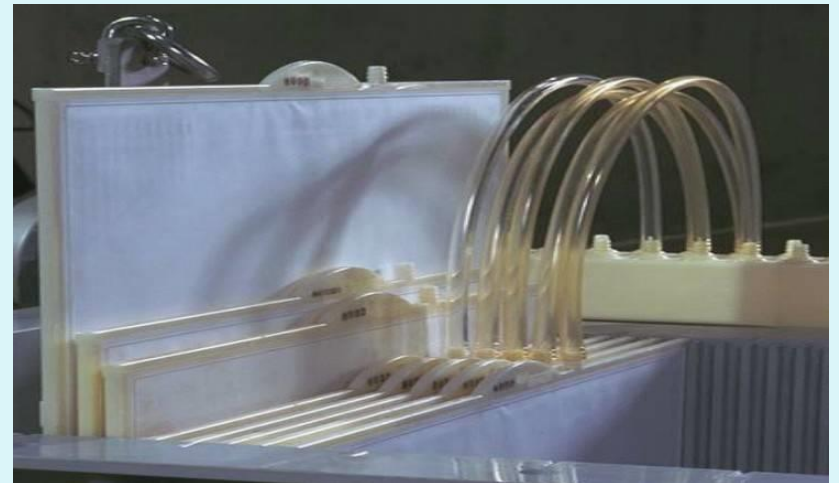
Hollow Fiber



Flat Sheet

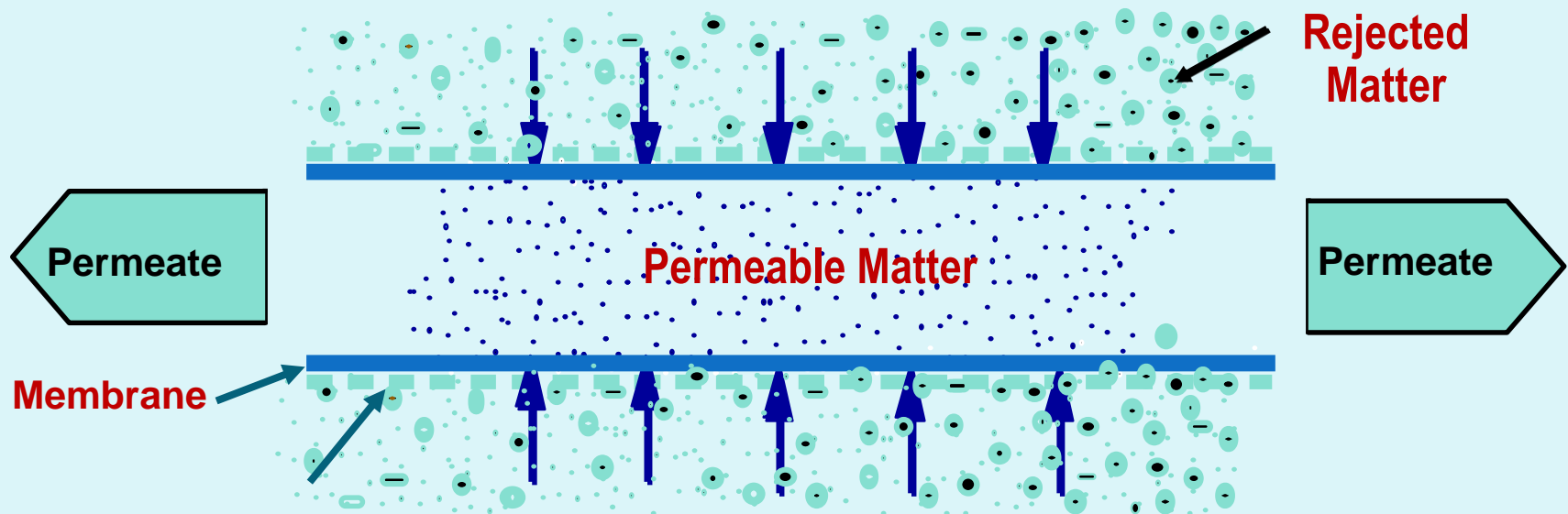
Flat Sheet Membrane

- Very suitable for small systems
- Micro Filtration (0.08 – 0.3 microns)
- Less chance of clogging
- Rugged construction – strong, durable

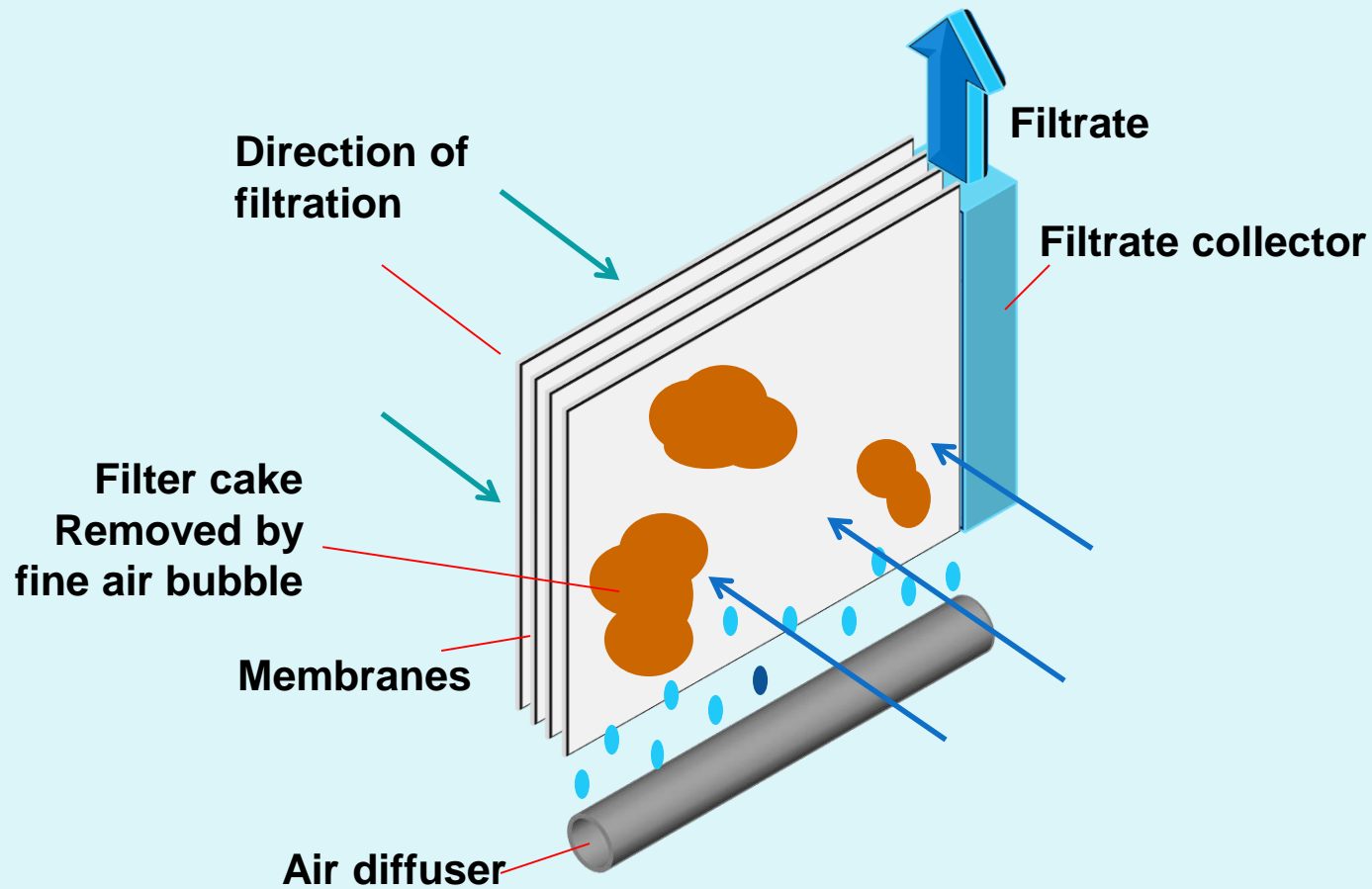


Immersed Membrane

Membrane submerged directly in process,
outside to inside flow under vacuum



Filter Operation



Why MBR?

- **The Highest, Consistent Effluent Quality**
 - BOD \leq 5 mg/L
 - TSS \leq 2 mg/L
 - Turbidity \leq 0.5 NTU
 - Fecal coli form \leq 200 CFU/100 mL (without disinfection)
 - Significant nutrient removal capability
 - Complete virus removal
 - Reduction of pharmaceutical byproducts

Why MBR?

- Simple to operate (compared to other processes trying to achieve same effluent quality)
- Robust biological process
- Energy efficient
- Ability to treat difficult wastewater

Why MBR?

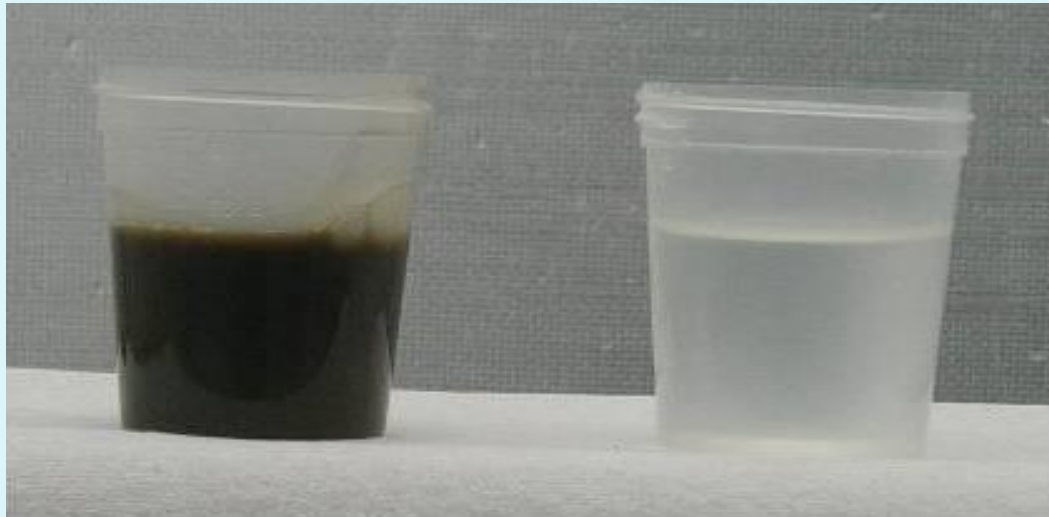
Mixed Liquor

MLSS 5,000 –
16,000 mg/l

Permeate

BOD < 5 mg/l
TSS < 1 mg/l
Turbidity < 0.2 NTU

Flow



NSF/ANSI Standard 245 for Wastewater Treatment Systems

Parameters	Influent	Effluent
Flow, gpd	500+	500+
BOD, mg/L	200	<4
TSS	190	<2
Total Nitrogen, mg/L	43	9
Alkalinity	210	
pH	7.3	6.5

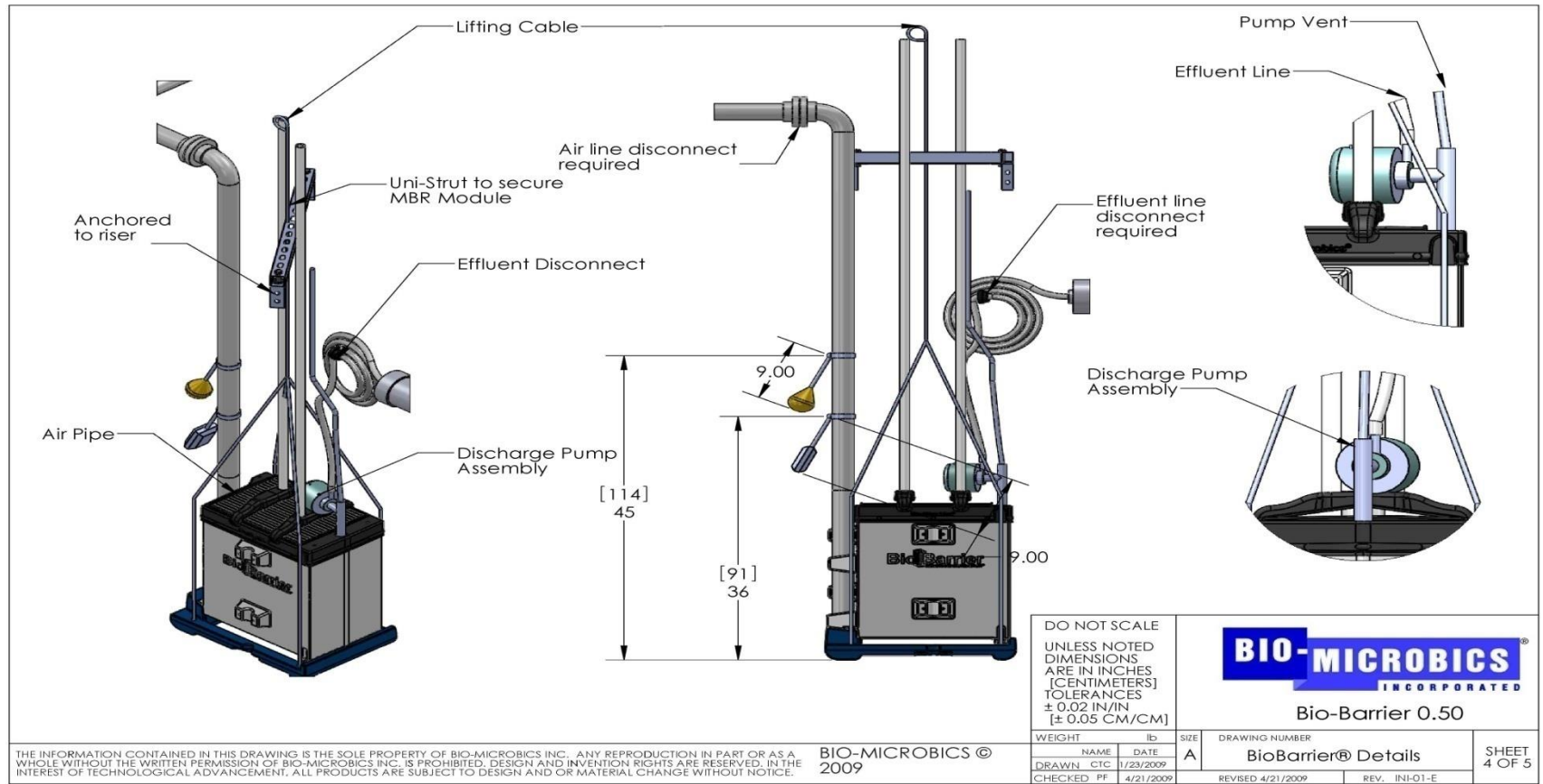
Value of MBR Over Conventional Process

- Fewer process steps to achieve results
- Lower chemical requirements
- Small Footprint
- Modular expansion capability
- High rejection efficiency of organic constituents, solids, and microorganisms
- Low effluent turbidity
- Excellent nutrient removal capability
- Lower sludge yield
- Eliminates filamentous sludge bulking issues

Basic Components

- SaniTEE[®] Screen
- Aeration Tank with Anoxic Zone
- Membrane Module with Aeration Grid
- Blower
- Permeate Pump
- Control
- Level Floats
- Supplemental Aeration for HSMBR

BioBarrier® 0.5



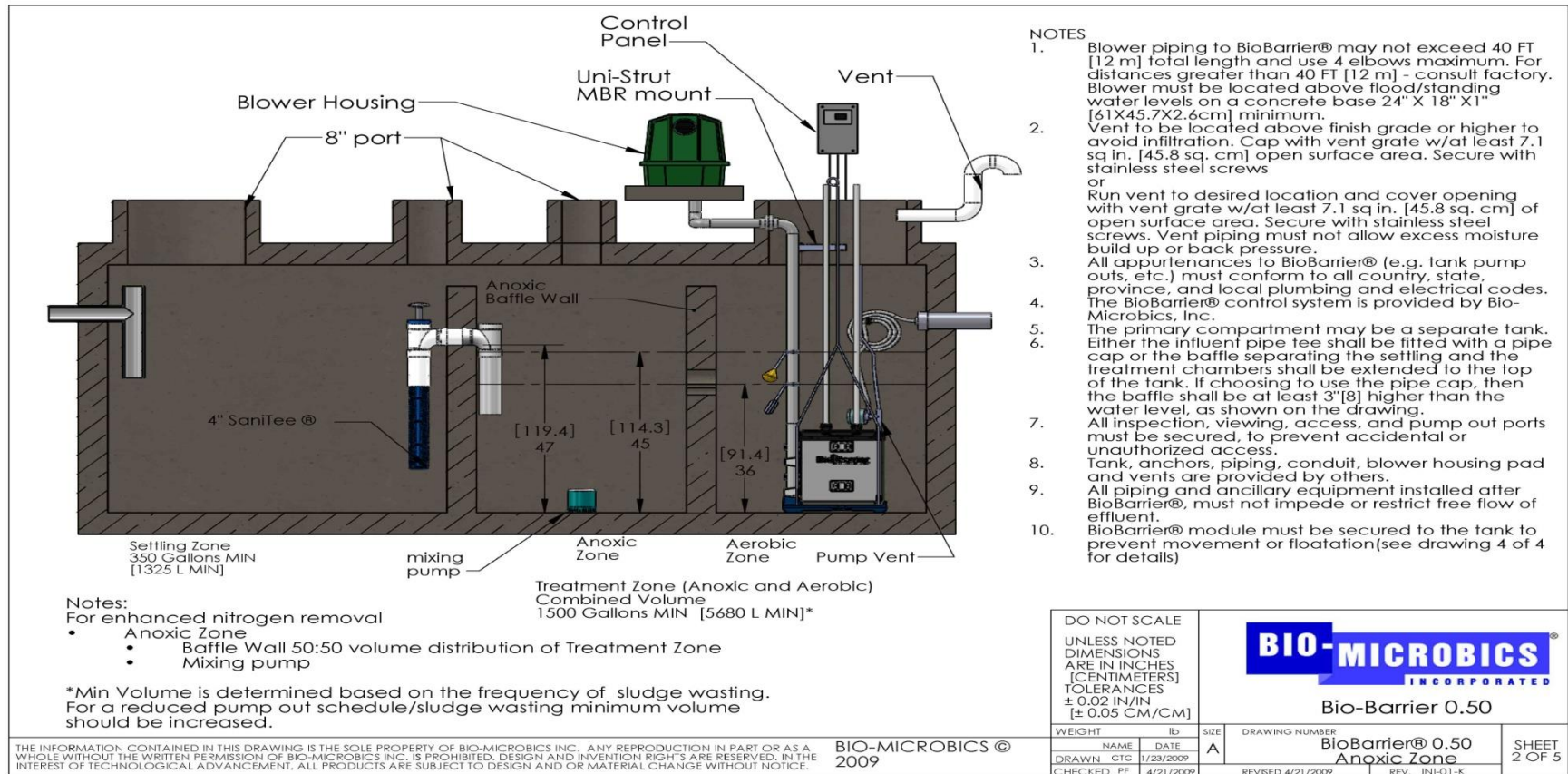
BioBarrier® Basic Components



BioBarrier® Basic Components

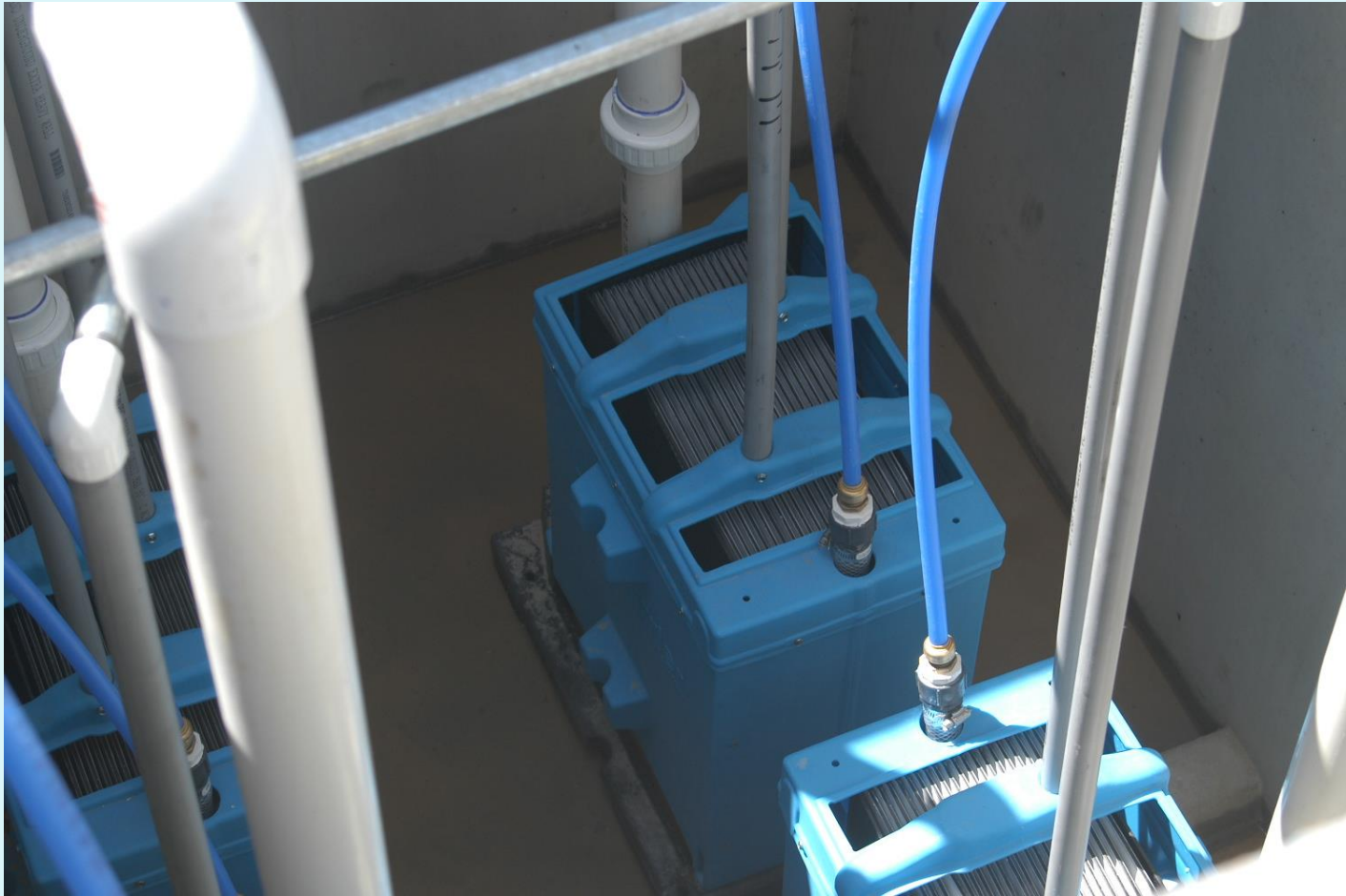


BioBarrier® 0.5





2,000 gpd BioBarrier® System



Double-Stacked BioBarrier®









Conclusions

- MBR is an attractive and feasible technology for on-site treatment applications.
- Consistent nutrient removal is possible with MBR system.....**Water reuse**
- MBR is more effective in treating wastewaters that are challenging for conventional biological treatment systems.