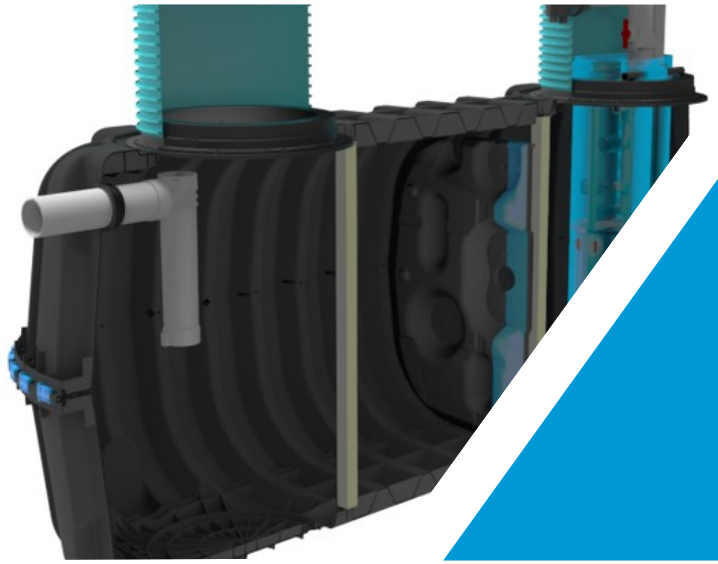
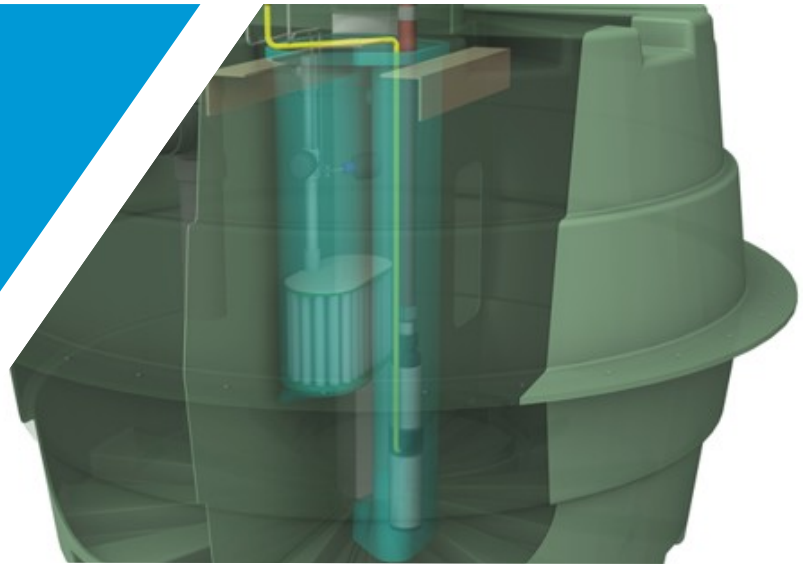
Infiltrator™ Water Technologies Part of ADS | Orenco® SYSTEMS





An Introduction to Pressurized Liquid-Only Sewer

Forrest Kunz

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

About Me

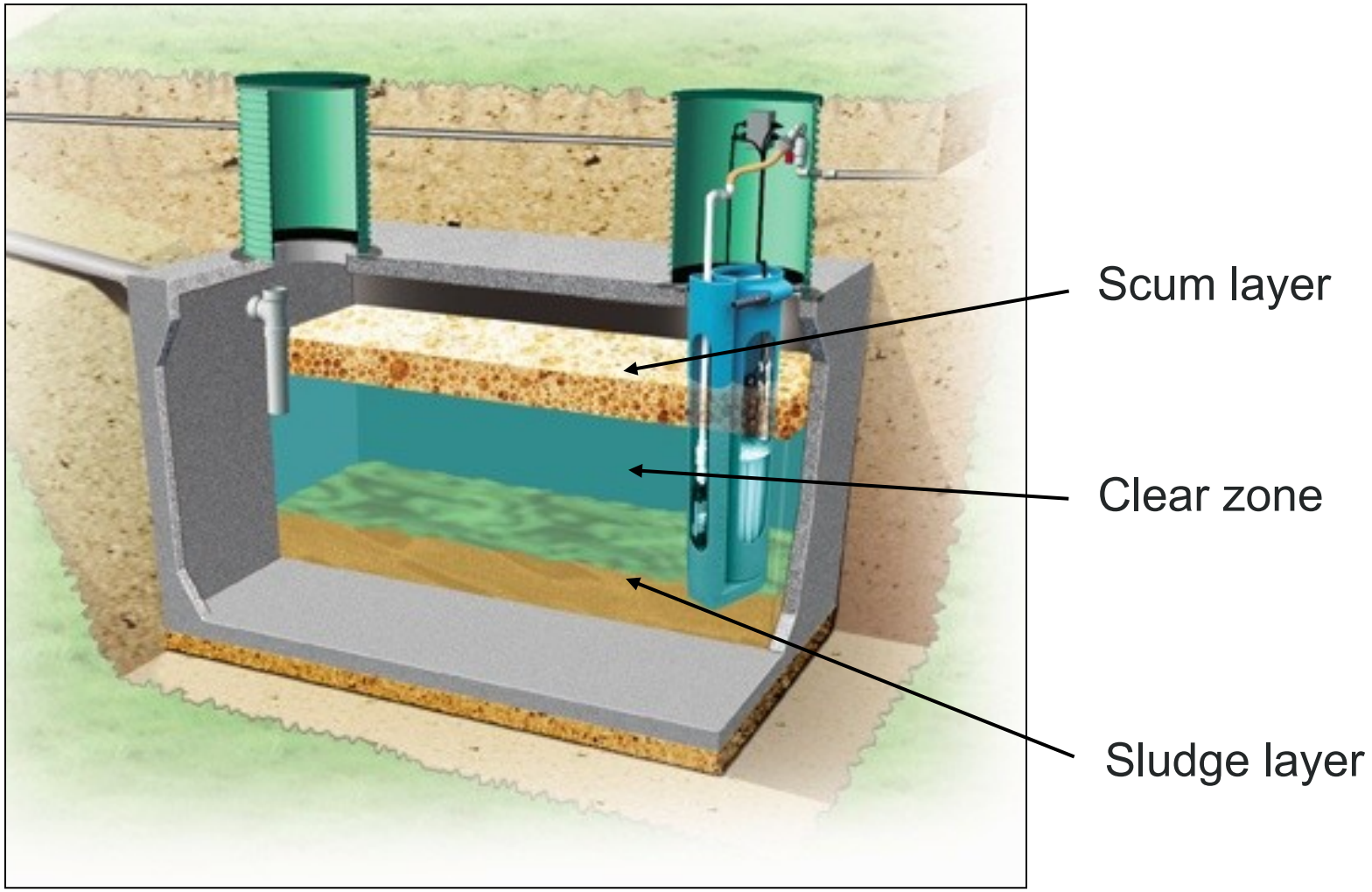
- Grew up in Park City, UT
- Graduated with a Bachelor's degree of Environmental Engineering from the University of Colorado Boulder (2023)
- Hired at Orenco in 2024
  - Worked as a Systems Engineer in the Midatlantic – design and technical support for commercial and municipal wastewater collection & treatment systems
  - Recently accepted a sales role as the ESC (Engineered Systems Consultant) for Mountain-West region (CO, UT, NM, AZ, KS, NE)
- Live in Denver, CO
- Love to run, hike, camp, ski, travel, and see live music!



Topics

- About Orenco
- The history of STEP/Effluent Sewer/Prelos/ProSTEP Sewer
- Major components of a Liquid-Only Sewer
- How does Liquid Only Sewer Work?
- Benefits
  - Pumping
  - Collection Mains
  - Treatment
- Maintenance

Basic Concept



So, what's it really called?

- Low pressure sewer (Florida)
- STEP (Septic Tank Effluent Pump)
- STEG (Septic Tank Effluent Gravity)
- Effluent Sewer
- Liquid-Only Sewer

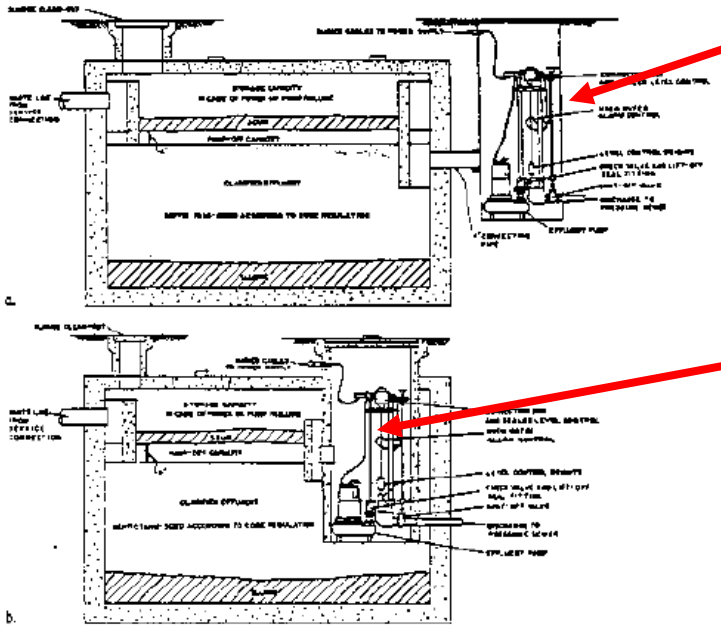


Florida STEP System (1981)

“STEP” defined as a Septic Tank Effluent Pump system

FIGURE II-2

TYPICAL SEPTIC TANK EFFLUENT PUMPSYSTEMS



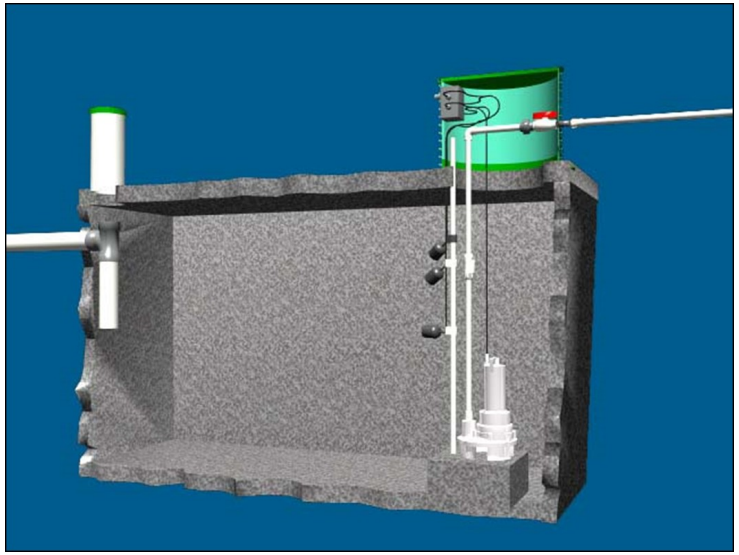
External pump basin

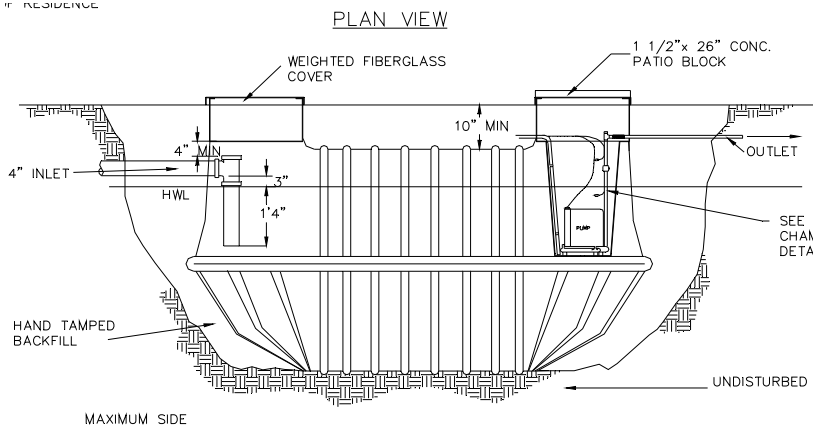
Pump on a shelf

Source: Design and Specification Guidelines for Low Pressure Sewer Systems, Florida DEP 1981

Early STEP Systems

- Poor quality leaking tanks
- “Pump-on-a-block” configuration
- “Pump-on-a-shelf” configuration
- Undersized, unbaffled tanks
- Low head effluent pumps
- Little or no filtering
- “Frankenstein Systems”





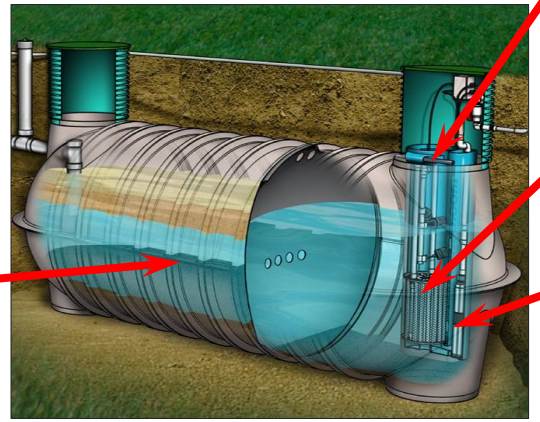
Orenco Liquid-Only Sewer



Filtered
Pump Vault
1984

Biotube®
Pump Vault
1994

Biotube®
Filter 1996



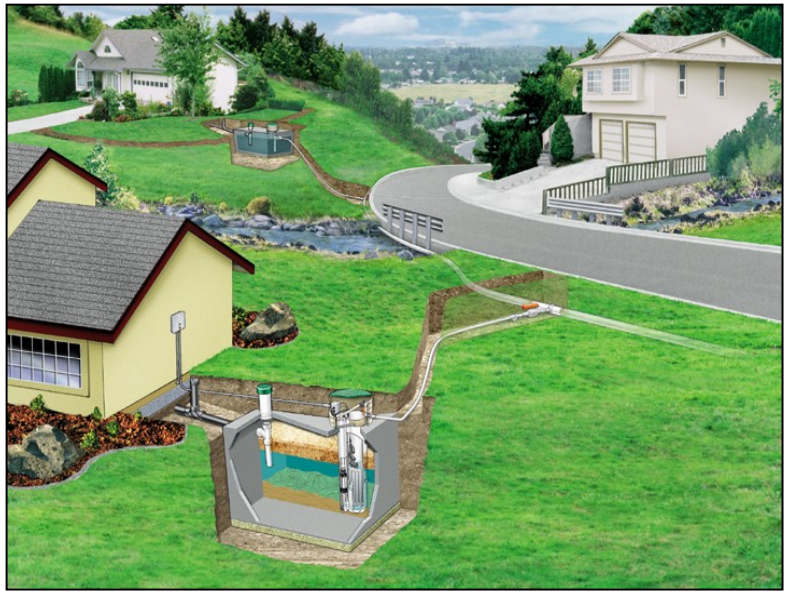
Molded
Fiberglass Tanks
2001

Turbine
Effluent Pump

Liquid-Only Sewer

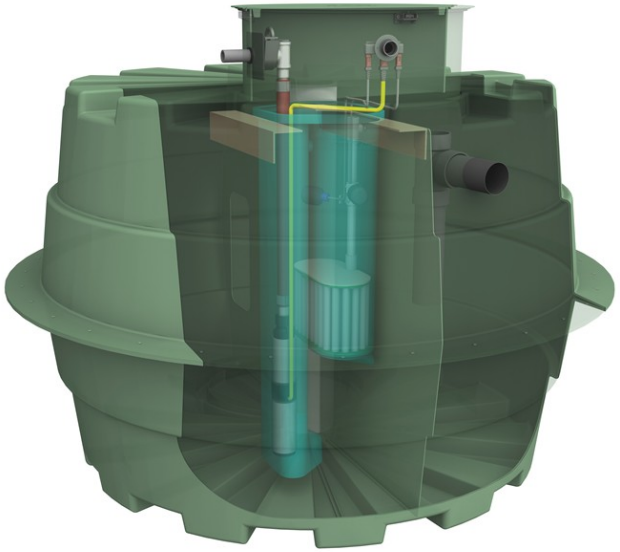
- Watertight tanks at each home/business
- Effluent pumps in each tank push effluent to WWTP
- 1/8" mesh effluent filter protects the pump
- Uses small-diameter transport and main lines
- Solids remain in tank







Prelos Liquid-Only Sewer



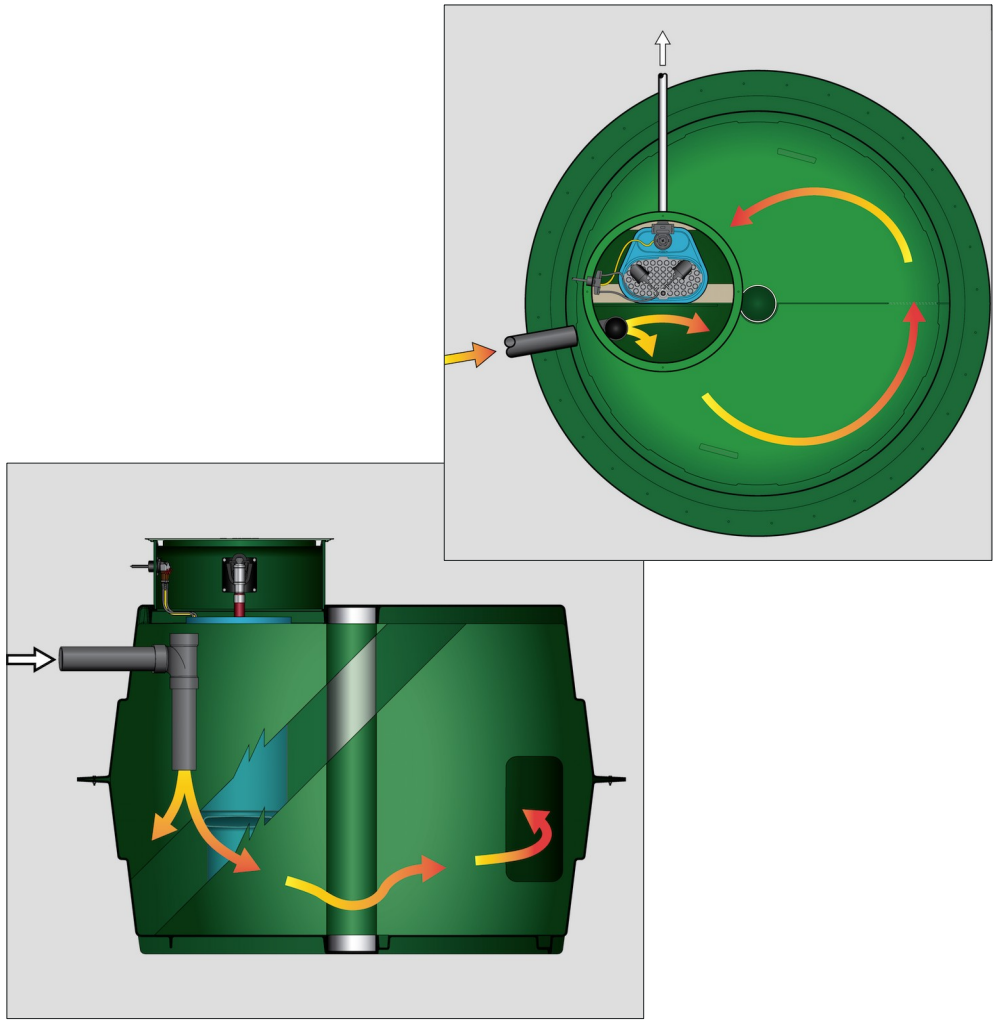




What Makes the Prelos Processor Unique?

The Patented Meander Tank

- Two compartments
- 90% longer flow path
- Molded DCPD construction
- Structural integrity assured
- Integrated fiberglass riser
- Provides primary treatment



Prelos Sewer



ProSTEP

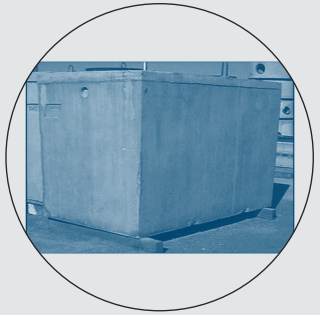
- Infiltrator ProSTEP Tank with Orenco Biotube ProSTEP package
- The ProSTEP Tank is a two-piece, compression- or injection-molded thermoplastic tank
- Benefits
  - Cost Effective
  - Reliable Filtration
  - Customizable
  - Environmentally friendly
- Available in 1,000, 1,250, and 1,500-Gal







Tank Options



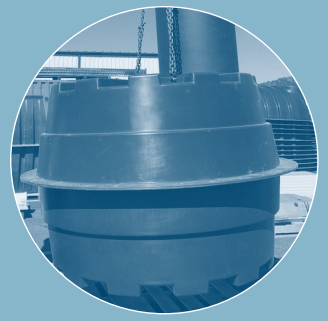
Concrete

- High compressive strength
- Low tensile strength
- Compromised by hydrogen sulfide
- QC/QA very important
- Heavy



FRP

- High strength
- High stiffness
- Some flexibility
- Lightweight
- Fiber reinforcement critical



DCPD

- High Strength
- Flexible
- High Impact Resistance
- Lightweight
- No reinforcement required



HDPE

- High tensile strength
- Highly flexible
- Strength established by shape & thickness
- Joints compromised by creep
- Lightweight

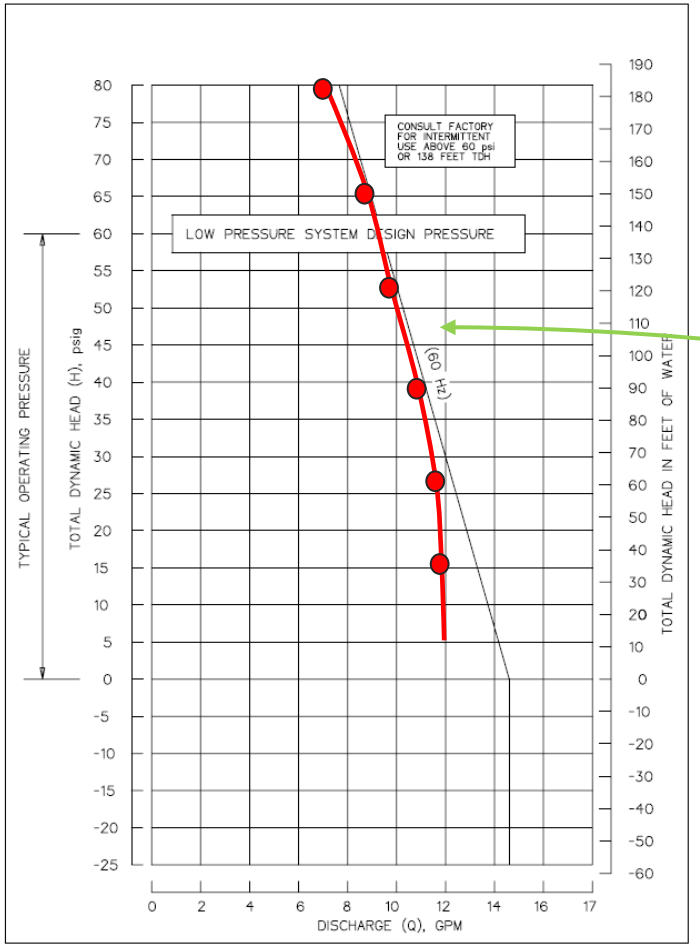
More Rigid ⟷ More Flexible

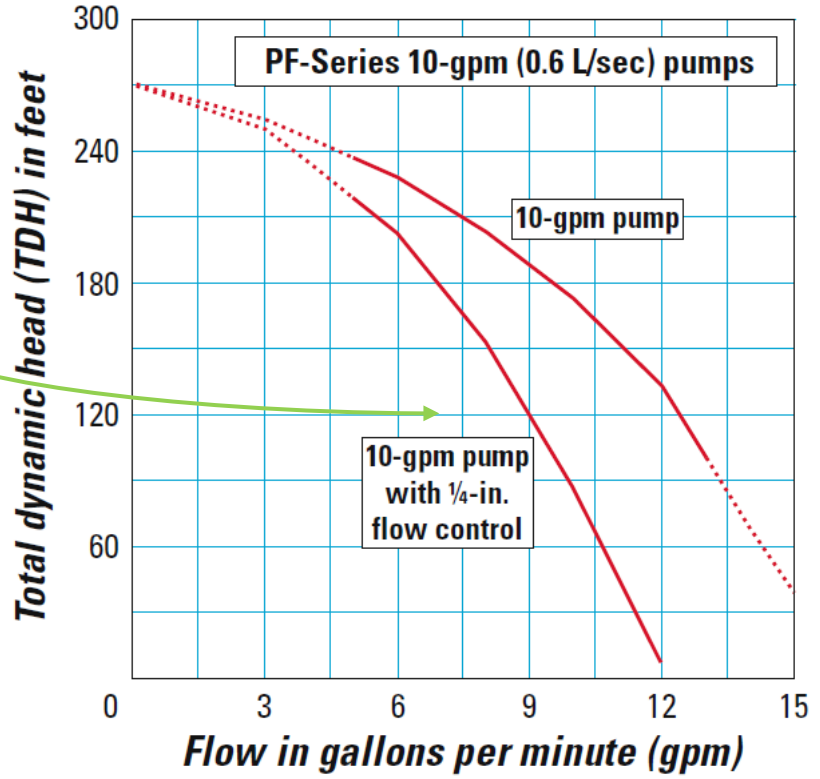
Liquid-Only Sewer Effluent Sewer Pumps

- Application adapted from water well industry in the 80s
- Only passes solids up to 1/8“ (3.175 mm)
- High Head - > 200’ (60 meters)
- Low Cost ~ $750 Light Weight ~ 30 lbs (13.6 kg)
- Robust – Up to 10-Year Warranty
- 20 to 25 year life cycle
- Rebuildable
- One pump for all residential applications



Pump Curves

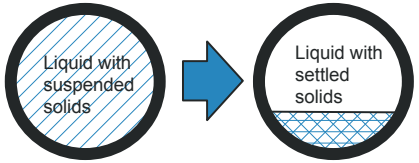




PF-Series 10-gpm pump curve

Force Mains



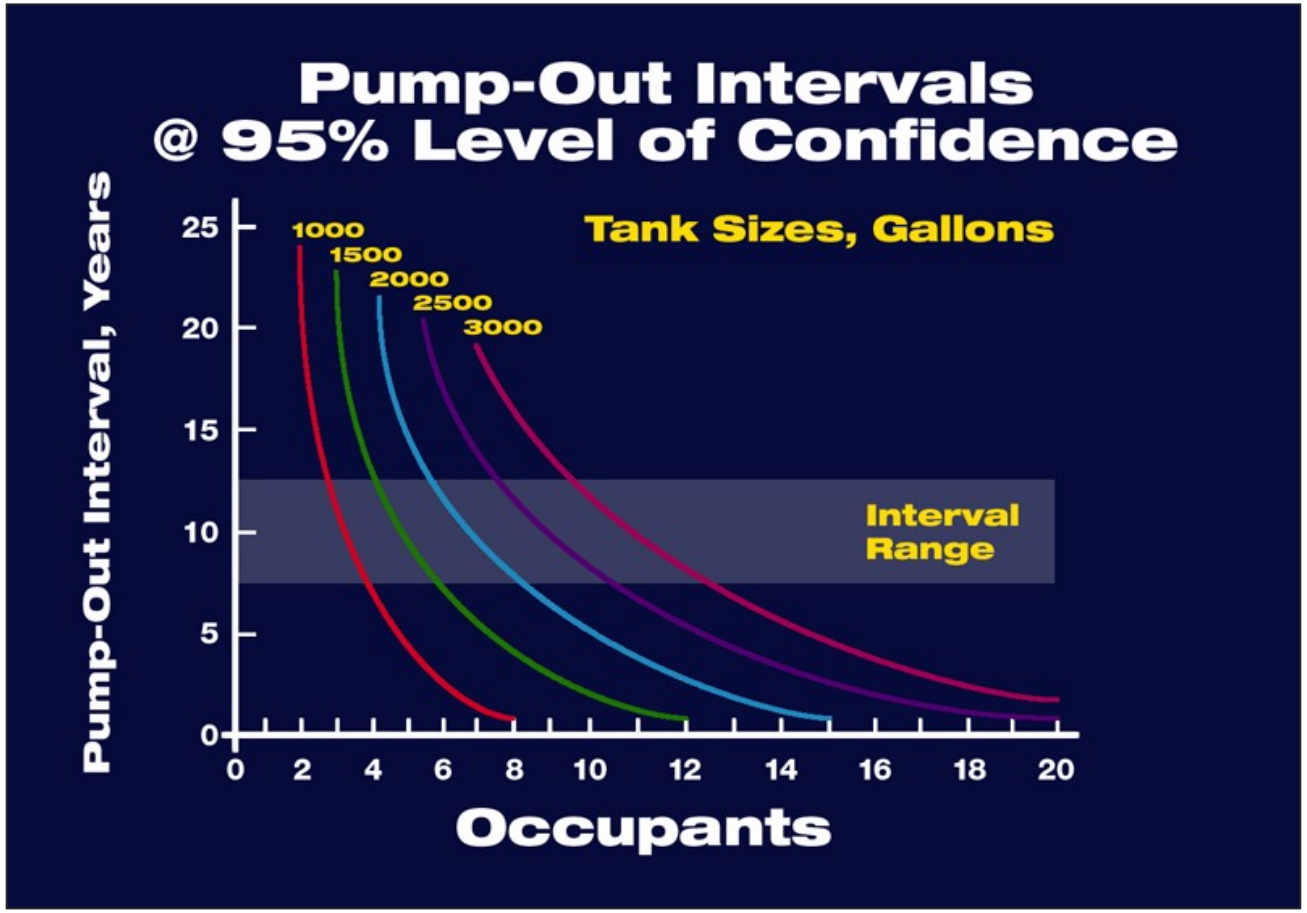


Factor	Prelos Sewer	Grinder Pumps & Lift Stations
Flow Velocity	Not Critical	>2 ft/s
Oversizing for future capacity	No limitation	Limited by flow velocity
Low build-out	No issue	Can cause sedimentation and odor problems
Pumping distances	Theoretically tens of miles	Limited by flow velocity
Extensions and additions	Typically, no problem	Could require pump upgrades, new lift station or replacement of mains
Fats oils and grease	Reduced by Prelos	Can plug mains

Solids Detention at the Source

- Settling and digestion
- Heavier solids sinks to the bottom, lighter solids float to the top
- Anaerobic microbes digest the waste
  - Produce methane, sulfur dioxide, and other gases
  - Heavier solids produce a dense sludge
- Efficiency increases over time
- Liquid Only Sewer systems combine passive primary treatment and collection in one package. They are the only technology to do so.

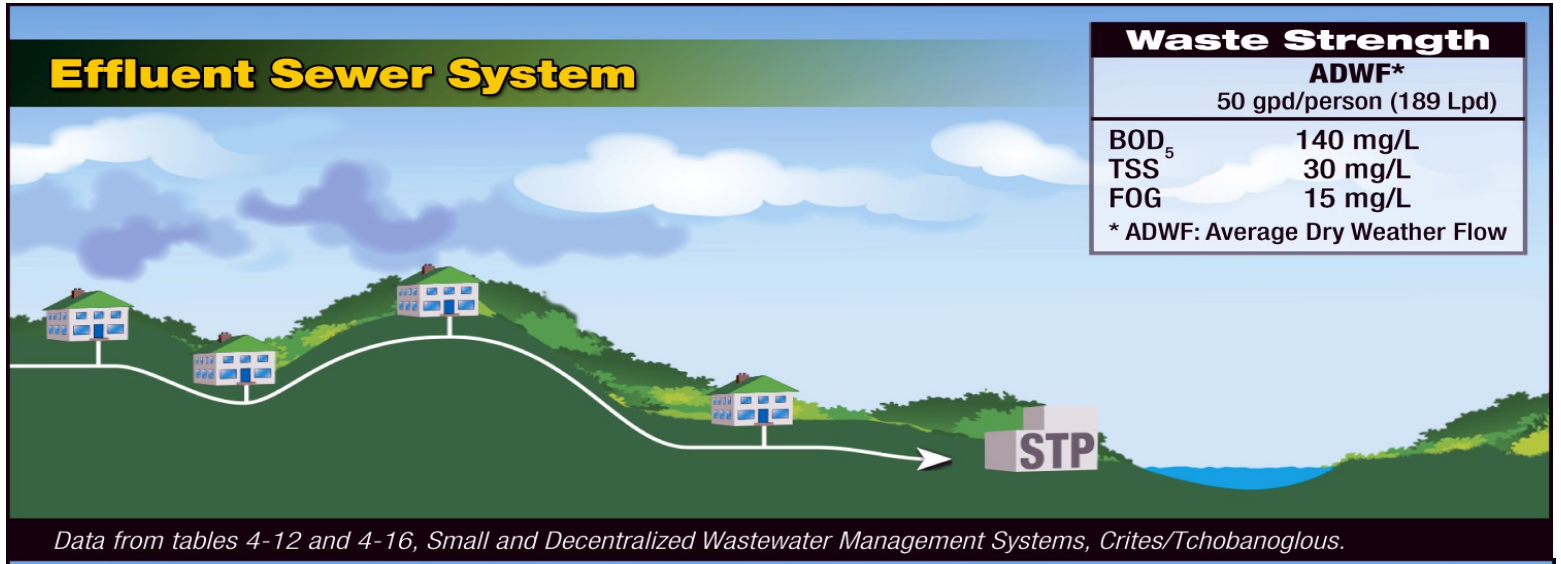
Pump-Out Intervals



The pumping interval for properly sized and managed watertight tanks is about 12-20 years.

Source: Bounds, T., PE. (1995). *Septic Tank Septage Pumping Intervals* [PDF]. Sutherlin, Oregon: Orenco Systems, Inc.

Wastewater Strength





Effects of LOS on WWTPs

Influent Waste Stream Characteristics

Typical Wastewater Collection System Daily per Capita Organic Loads

	Effluent Sewer	Grinder Sewer	Gravity Sewer
Oxygen Requirements			
Carbonaceous O_2	0.063 lbs/day	0.188 lbs/day	0.200 lbs/day
Nitrogenous O_2	0.103 lbs/day	0.111 lbs/day	0.133 lbs/day
Sludge Production			
Heterotrophic, $P_{x,vss}$	0.019 lbs/day	0.058 lbs/day	0.061 lbs/day
Autotrophic, $P_{x,nvss}$	0.0014 lbs/day	0.0015 lbs/day	0.0018 lbs/day

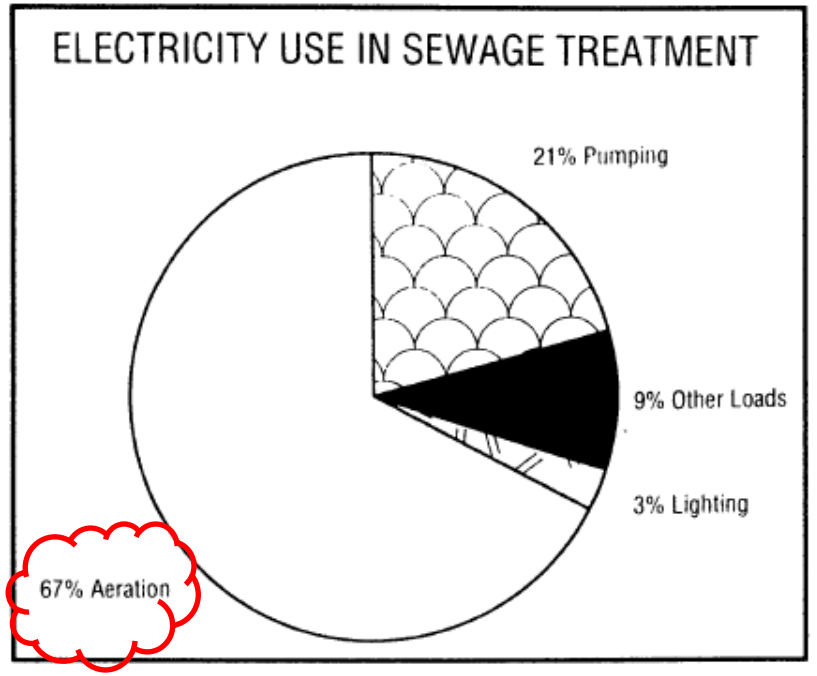
Metcalf & Eddy, 2003. Crites and Tchobanoglous, 1998.
“Optimizing MBR Treatment Facilities with Effluent Sewer Collection Systems” T.R.Bounds, PE, Tyler J. Molatore, PE

Electrical Costs Associated with Wastewater Treatment

Figure 6 WWTP Efficiency Baseline Ranges

Treatment Type	Flow (MGD)	MWh/MG	kWh/lb BOD
Extended Air	<0.1	1.1 - 46.0	1.9 - 20.3
Conventional Activated Sludge	0.1 - <0.5	3.3 - 6.9	2.5 - 4.9
	0.1 - <0.5	2.5 - 5.3	2.8 - 6.3
	0.5 - <5	1.1 - 6.1	0.9 - 4.7
	>5	0.4 - 1.2	0.2 - 2.2
Sequential Batch Reactor	<0.1	8.7 - 25	3.2 - 7.1
	0.1 - <0.5	1.2 - 12.6	1.6 - 7.2
	0.5 - <5	1.8 - 6.6	1.4 - 4.5
Oxidation Ditch	0.1 - <0.5	2.2 - 6.6	2.1 - 6.4
	0.5 - <5	3.3 - 4.5	1.6 - 5.1

Source: Electric Use at Pennsylvania Sewage Treatment Plants (PDEP 2011).



Higher wastewater strength and more biosolids equate to more energy use.

Liquid-Only Sewer System O&M

- Occasional inspection and cleaning
  - Pull and clean effluent filter
  - Record depth of sludge and scum layer
  - Verify pump amperages
  - Verify float operation
- Documented tank pump-out intervals of 10 to 12 years
- About $1 per month for electricity per household

30 minutes Preventative Maintenance (3-5 years)

Electrical Usage: Liquid-Only Sewer

- All costs typically funded by homeowner

	Pump	Pump Run Time	Power Cost	Equivalent Monthly Costs ($/month/EDU)
LOS or Orenco Effluent Sewer	0.5 Hp, 115 VAC, 12 amps	20 mins/day	$0.18/kWh	**$1.80**

Reactive Maintenance (RM): LOS Systems







State	Community	EDUs	Screened	Hrs/mo./100 EDUs
CA	Mt. Lake Estate	8	yes	1.0
CA	Villa Verona	337	yes	2.5
MT	Missoula	350	yes	1.5
OR	Elkton	135	yes	0.7
OR	Glide	1,054	30%	1.5
OR	Lakeside	51	yes	0.3
OR	La Pine	215	yes	1.8
OR	Tangent	180	yes	2.5
WA	Boston Harbor	166	yes	1.6
WA	Conconnully Lake	75	yes	0.5
WA	Diamond Lake	525	yes	1.2

Typical to see 1 FTE with small service truck maintaining > 3000 connections

City of Lacey, Washington

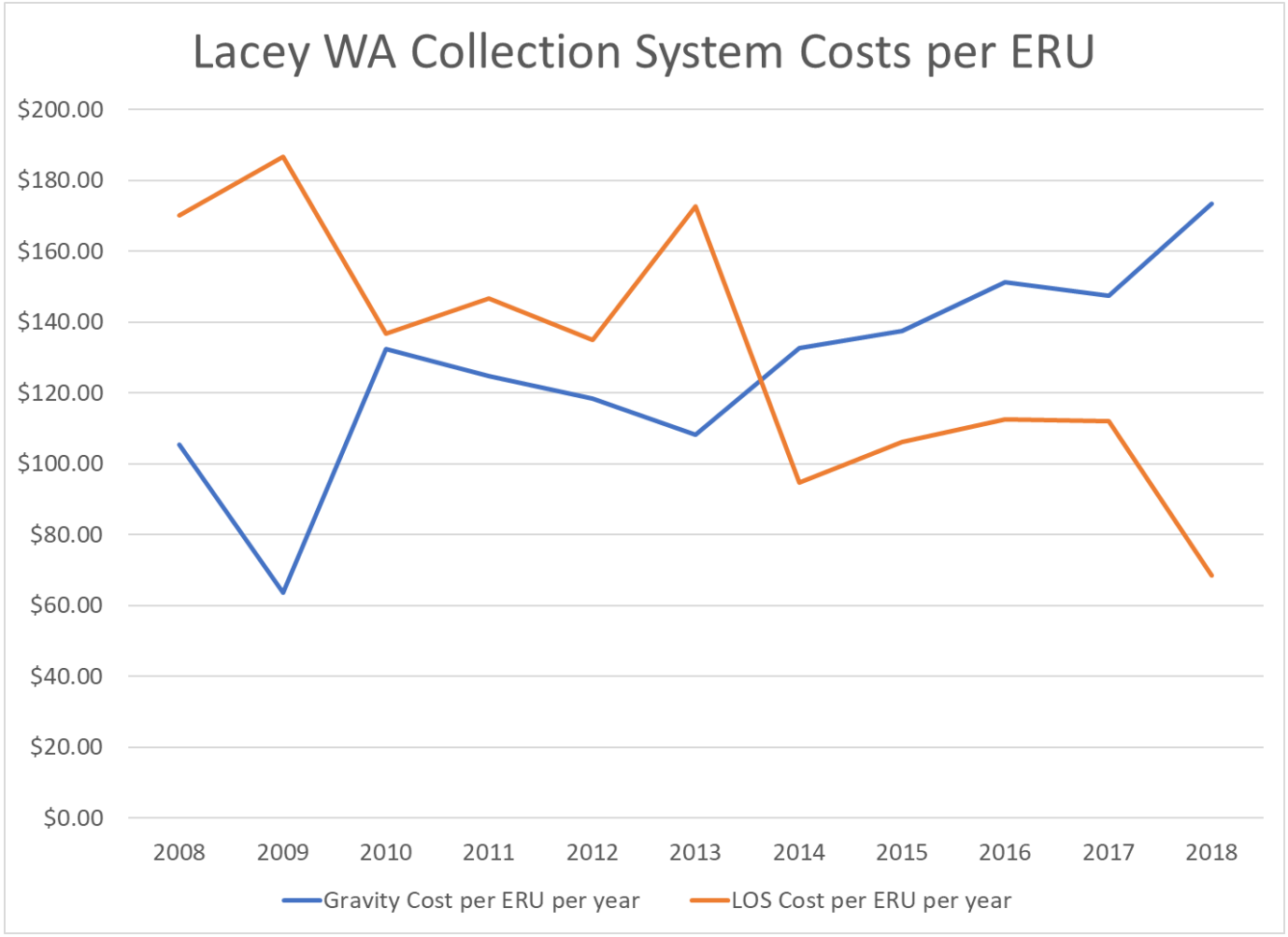
Liquid-Only Sewer System O&M

- Installed in 1989
- ~ 4,000 total STEP, 12,000 gravity, and 3,000 grinder connections
- City utilizes 2 full-time employees for STEP
- Since 2008, all properties are on an 8-year maintenance cycle
- Fewer than 20 pumps replaced
- Cost for operating STEP is currently lower than the gravity sewer



Liquid-Only Sewer vs. Gravity

Lacey, WA



Summary

- Liquid-Only Sewer has been in use for almost 50 years
- Orenco has been providing liquid only sewer systems for 40 years
- Liquid-Only sewer provides primary treatment, collection and conveyance
- Solids retentions results in more efficient pumping, less costly treatment and lower O&M costs
- Liquid-Only Sewer can be provided as a complete unit ready for installation
- There are different configurations of liquid only sewer
- Orenco/IWT provides complete units (Prelos, ProSTEP) or a liquid-only sewer package for use in alternative tanks
- Liquid only sewer provides a sustainable O&M cost

Orenco/IWT Websites

- Visit our websites for more information!
- https://www.orenco.com/
- https://www.adspipe.com/infiltrator

Questions?