

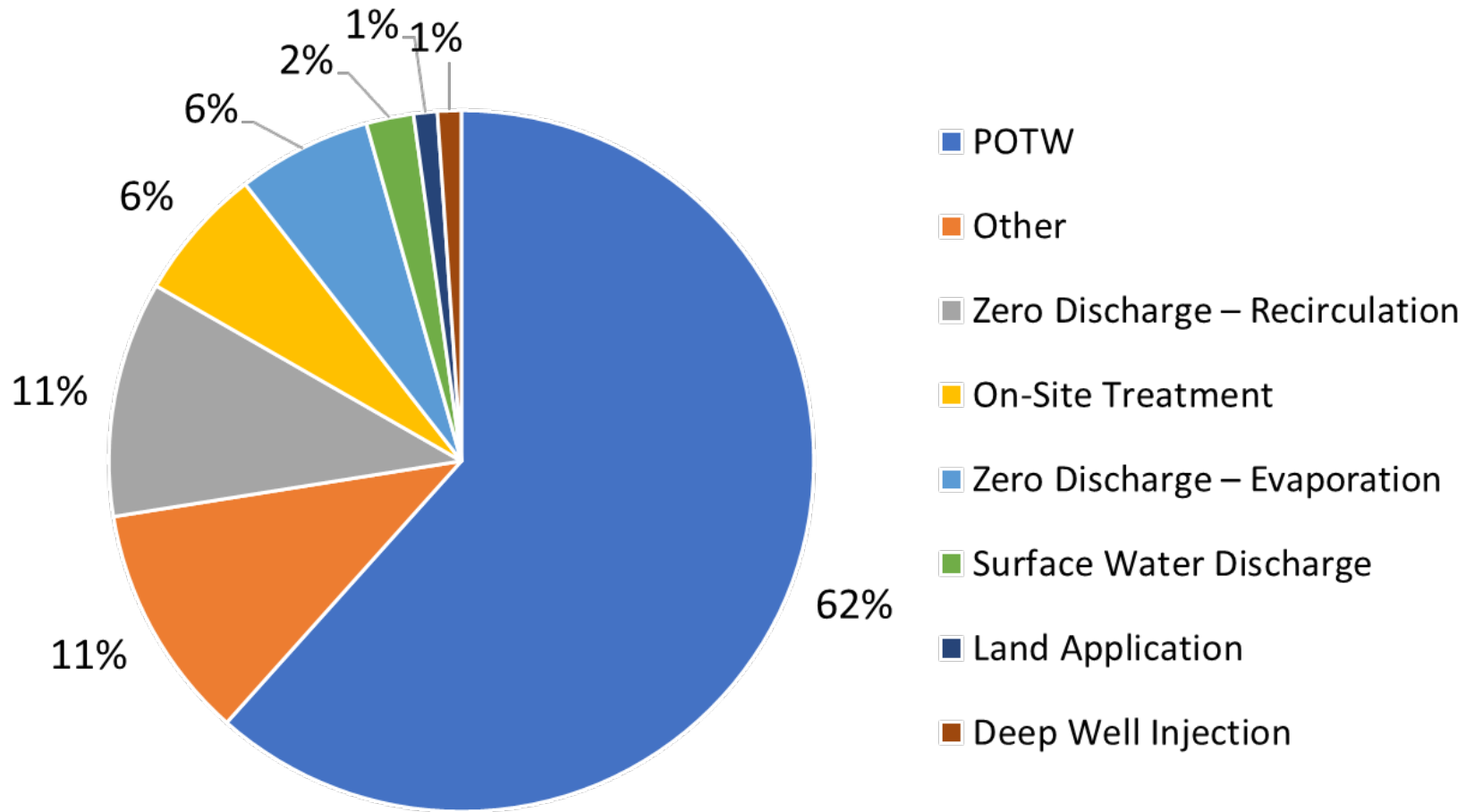


LEACHATE MANAGEMENT CHALLENGES

Michigan Department of
Environment, Great Lakes and Energy
(EGLE)

Upper Peninsula Solid Waste Forum
April 25, 2019

EREF Leachate Management Survey



MWRA Report

- 32 landfills participated in study
- 21 landfills discharge directly or pump/haul to POTW
- 10 landfills haul to CWT
- 2 landfills haul to deep well
- 1 landfill RO treatment w/surface water discharge

Emerging Leachate Issues

- POTW limitations
 - UV transmittance
- Emerging contaminants
 - PFAS
 - 1,4-dioxane
 - Others?
- Changing waste composition

Leachate Management Options

- Minimization
- Treatment

Leachate Management Options

- Off Site
 - Deep Well
 - Industrial / Centralized Waste Treatment
 - POTW

Leachate Management Options

- On Site
 - Recirculation
 - Evaporation



Source: Neptune



Source: Heartland

Leachate Management Options

- On Site
 - Biological
 - Precipitation
 - Oxidation
 - Activated Carbon
 - Ion Exchange
 - Membrane Treatment

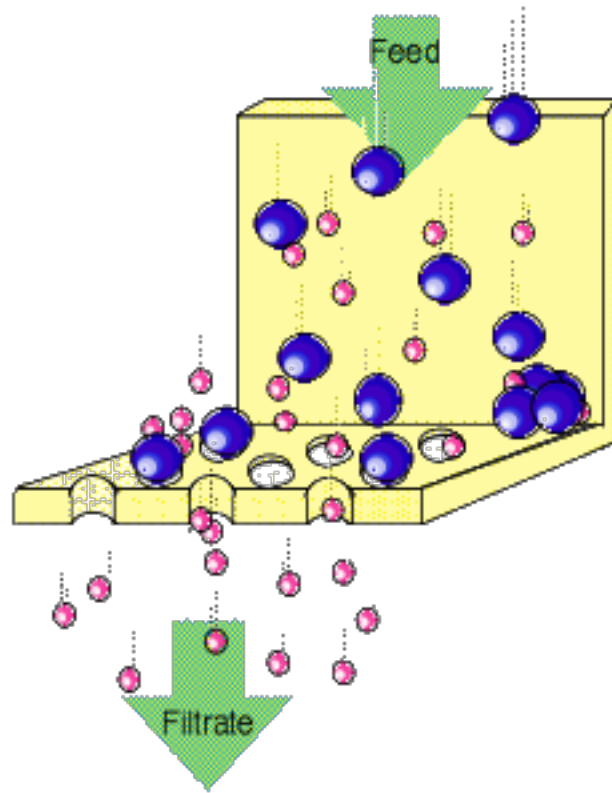


Membrane Technology

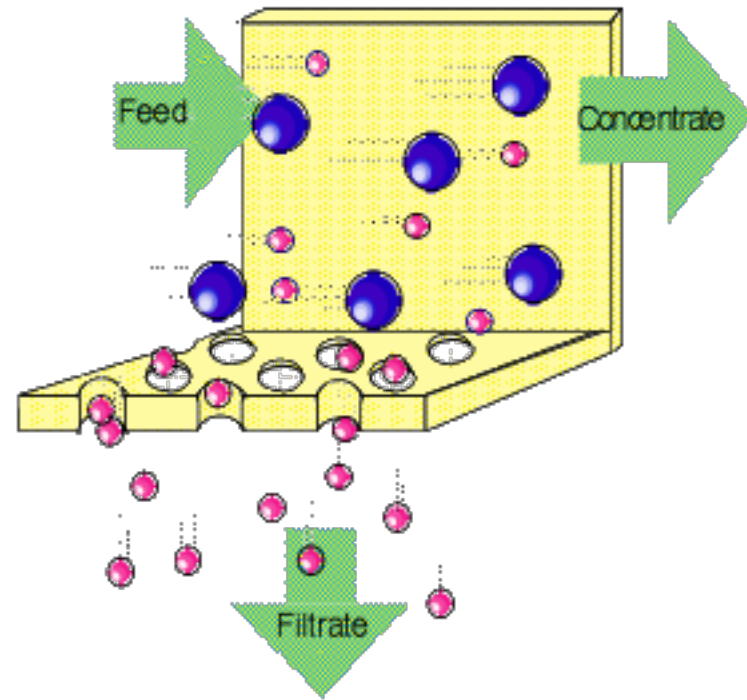
- Commercial applications since 1970s
- Used for desalination of seawater and brackish water sources

Separation Process

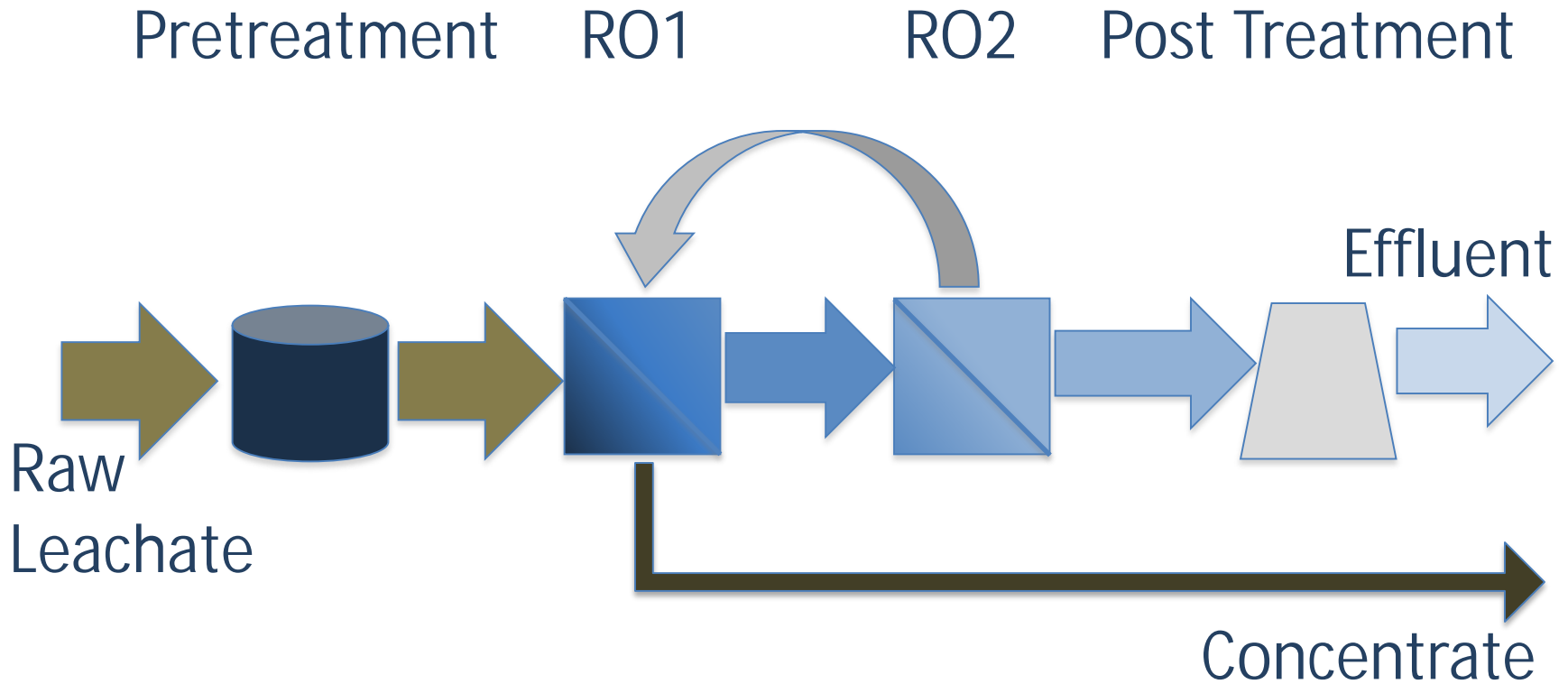
Filtration



Separation



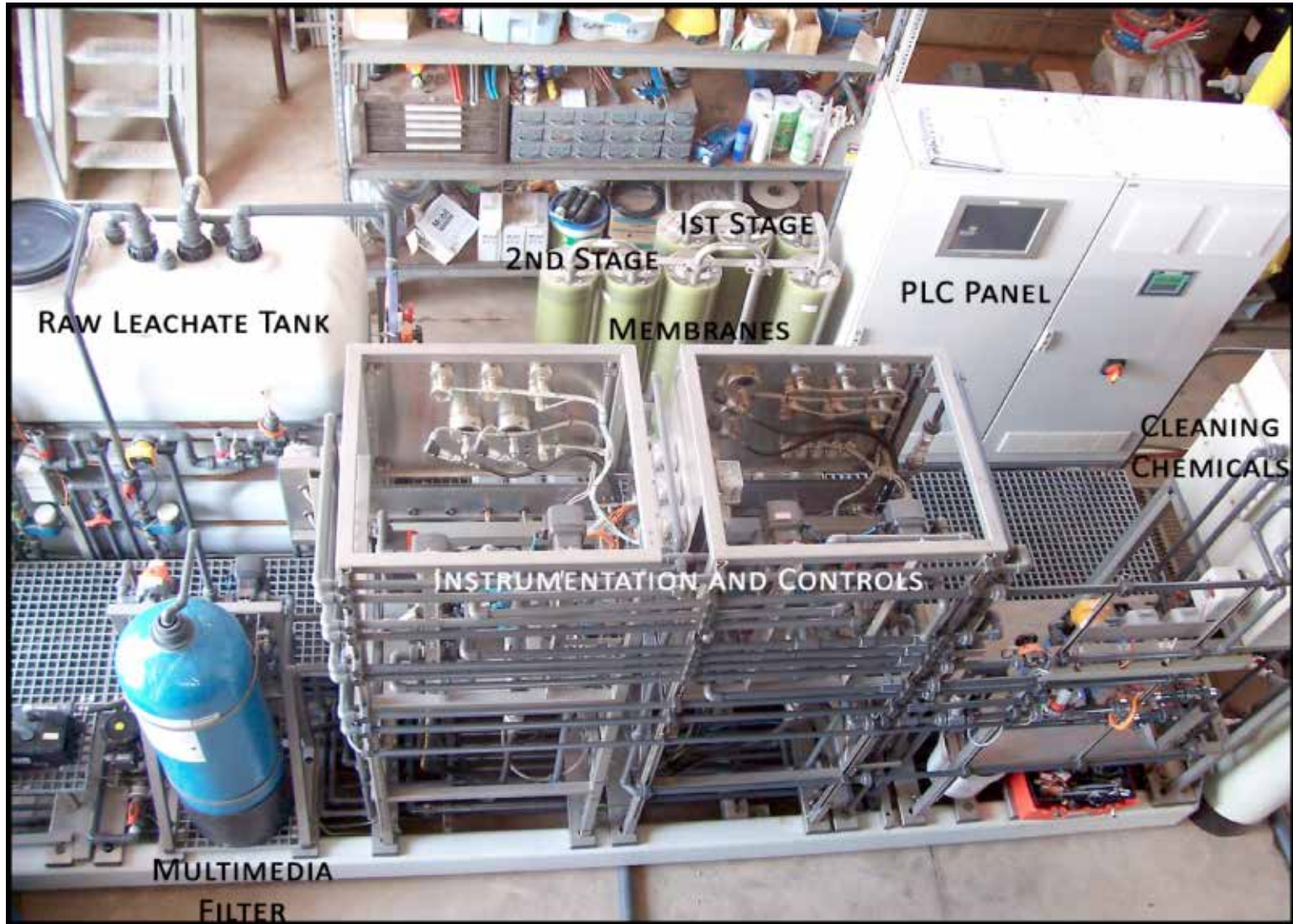
RO Block Flow Diagram



Typical RO Performance

Parameter	Units	Leachate	RO 1 Permeate	RO 2 Permeate	Rejection
Total Dissolved Solids	mg/L	23,800	308	16	>99%
Biochemical Oxygen Demand	mg/L	392	39	3.4	99%
Chemical Oxygen Demand	mg/L	9,070	163.3	2.9	>99%
Total Organic Carbon	mg/L	7,330	187	4.7	>99%
Total Suspended Solids	mg/L	57	0.80	0.0	>99%
Kjeldahl Nitrogen	mg/L	7,970	841	77	>99%
Ammonia-Nitrogen	mg/L	1,800	60	2	>99%
Nitrate	mg/L	0.2	0.02	0.002	99%
Phosphate	mg/L	5.50	0.12	0.003	>99%
Zinc	mg/L	0.1	0.004	0.0002	>99%
Chromium	µg/L	780	4.2	0.023	>99%
Phenol	µg/L	1,100	220	34	>96%
Mercury	ng/L	196	3.7	1.0	>99%

Pilot System



Leachate Treatment System



450,000 gpd Facility



Leachate Treatment System



Leachate Treatment System



Summary

- Emerging leachate challenges
- Leachate costs represent up to 30% of landfill operating costs
- Evaluate treatment options carefully
- Control your own destiny
- RO is a proven and accepted technology

Thank You

Paul Sgriccia, PE
Rochem Americas, Inc.
248.863.7522

Paul@RochemAmericas.com

www.RochemAmericas.com

Site R1 RO PFAS Rejection Results

Compound (ng/l)	Leachate	RO 1 Permeate	RO 2 Permeate	Rejection
Perfluorobutanesulfonic acid (PFBS)	280	<2	<1.9	>99.3%
Perfluorobutanoic acid (PFBA)	1100	5	<1.9	>99.8%
Perfluoroheptanoic acid (PFHpA)	480	<2	<1.9	>99.6%
Perfluorohexanesulfonic acid (PFHxS)	690	<2	<1.9	>99.7%
Perfluorohexanoic acid (PFHxA)	2100	7.8	<1.9	>99.9%
Perfluorooctanesulfonic acid (PFOS)	200	<2	<1.9	>99.1%
Perfluorooctanoic acid (PFOA)	820	2.5	<1.9	>99.8%
Perfluoropentanoic acid (PFPeA)	880	2.7	<1.9	>99.8%
Total	6550	18	<1.9	>99.9%

Site N1 RO PFAS Rejection Results

Compound (ng/l)	Leachate	2-Pass Effluent	Rejection
Perfluoro(3,5-dioxahexanoic) acid (PFO2HxA)	599	<1.19	>99.8%
Perfluoro-2-methoxyacetic acid (PFMOAA)	780	<1.19	>99.8%
Perfluoro-4-methoxybutanic acid (PFMOBA)	1070	<1.19	>99.8%
Perfluorobutanesulfonic acid (PFBS)	1220	<0.595	>99.9%
Perfluorobutanoic acid (PFBA)	2040	<0.595	>99.9%
Perfluoroheptanoic acid (PFHpA)	593	<0.595	>99.9%
Perfluorohexanesulfonic acid (PFHxS)	931	<0.595	>99.9%
Perfluorohexanoic acid (PFHxA)	2410	<0.595	>99.9%
Perfluorooctanesulfonic acid (PFOS)	228	<0.595	>99.7%
Perfluorooctanoic acid (PFOA)	1250	<0.595	>99.9%
Perfluoropentanoic acid (PFPeA)	1110	<0.595	>99.9%

< is value below Method Detection Limit