Converting sludge into reusable water and biofuel

globalgreen international

THE PROCESS – SUPER CONCENTRATE BIO-SOLIDS

The GGI proprietary process turns 97% liquid wastewater sludge into 20%-30% moisture with 70% to 80% combustible bio-solids. This process achieves the US EPA Part 503 approval – required pathogen vector reduction threshold (Subpart D Option 7)

Despite representing only about 1% of total wastewater flows, sludge handling accounts for up to 50% of total treatment plant operating and energy costs.

Market Summary

- **Municipal** wastewater sewage sludge treatment facilities (holding lagoon/tanks cleanouts);
- **Agricultural** manures & processing plant sludge (animal and vegetable)
- **Aquaculture** applications (fish pond solids removal)
- **Industrial** wastewater sludge
- **Oil** solids removal

Municipal Sewage Sludge

(Public) Harrisonville, MO

(Public) Clinton, MO

(Public) Independence, MO

Manures

(Private) Egg layer manure (Le Sueur, MN)

(Private) Hog manure (Monroe City, MO)

Vegetable & Meat Processing Sludge

Meat (St. Joseph, MO)

Vegetable (Faribault, MN)

Vegetable (Renville, MN)

Other Sludge

(Private) Landfill/Leachate (Shakopee, MN)

(Private) Paper (Cedar Rapids, IA)

THE SLUDGE DILEMMA

Ineffective Treatment

- Aging infrastructure and technology (polymer induced thickening process……..dewatering process with screw press/belt press/filter press/decanter/centrifuge……..drying process using thermal energy……..landfill).
* High moisture content (average 70% moisture-30% solids…..best result is 60-40) even after all the processes.

Non-compliance Liquid Discharge

- Post dewatering liquid is 4X higher in conductivity and will usually end up flowing into drains and water catchment areas.

High Treatment and Disposal Cost

- Traditionally sludge treatment is >50% of total cost of WWTP operating cost. This is just to mitigate 1% of total flow!
- Disposal cost for dewatered sludge in Asia is USD100 to USD1200 per ton (usually at 70%-80% moisture content).
- High logistic cost for transporting 70% to 80% liquid when the nutrients are actually in the solids for recycling or reuse.

Landfill Requirement

- Cost of landfill is high (from USD15 to USD70 per ton for normal waste) – sludge can be 3X higher than this.
- Land is scarce and local government are introducing mandates on waste reduction to landfills.
- Sludge require special sanitary landfill treatment processes because of leaching.

Detrimental Environmental Impact

- Leaching into environment and affecting ground water.
- Sludge solids are high in contamination posing an immediate danger to human, plant and animals.
- Landfills for sludge are usually deemed unfit for agriculture use.

Current Solutions

Land/Crop Application

Haulers ***(landfill and lagoons)***

Mechanical ***(belt press/centrifuge dewatering)***

Incineration ***(heat & power generation)***

OUR SOLUTION

The Technological Shift

Sludge is a RESOURCE

- Uncovering hidden energy within the sludge solids (activated sewage sludge usually has a calorific value between 1200 to 1500 kcal/kg, farm sludge will have higher calorific value ranging between 2000 to 4000 kcal/kg).

Innovative Treatment Process

- Single-pass real time separation of liquid–solids without any need for thickening process and polymers dosage.
- Separated bio-solids at 70% to 80% and liquid at 30% to 20% in one pass.
- Combustible bio-solids (with increased GCV)
- Flexible in-take points (EQ, O&G trap, Sludge tank)
- Resilient to pH, O&G, Temperature, high TS & VS
- Modular and tested design
- Mobile sludge treatment process
- Small footprint

Cost Savings on Treatment Process

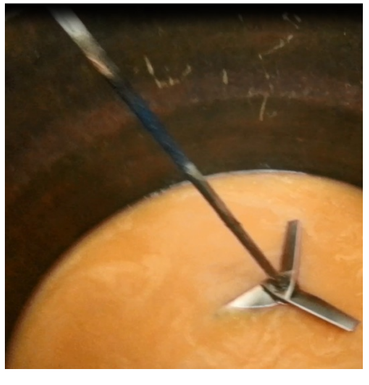
- Minimized sludge treatment train to one process, thus saving on chemical coagulant, power, personnel and logistics cost compared to traditional sludge dewatering and disposal process.
- Savings on Capex and Opex when system is applied to EQ stage (secondary and sludge treatment no longer required).
- Huge savings on disposal cost.

Achievement on Zero-Discharge and Zero-Landfill

- Reusable liquid as utility or process water
- Bio-solids are used as high GCV alternative solid fuel (with lower GHG emissions).
- Alternative usage for bio-solids as soil enhancement fertilizer (only with agriculture sludge).

THE ZERO DISCHARGE PROCESS

Step 1
Identify intake point



Step 2
Slurry mix process

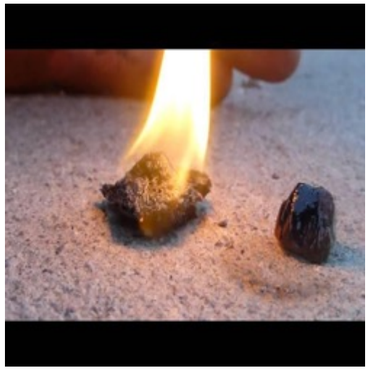
Step 3
Preparation process

Step 4
Separation process

Step 5
Cutting process

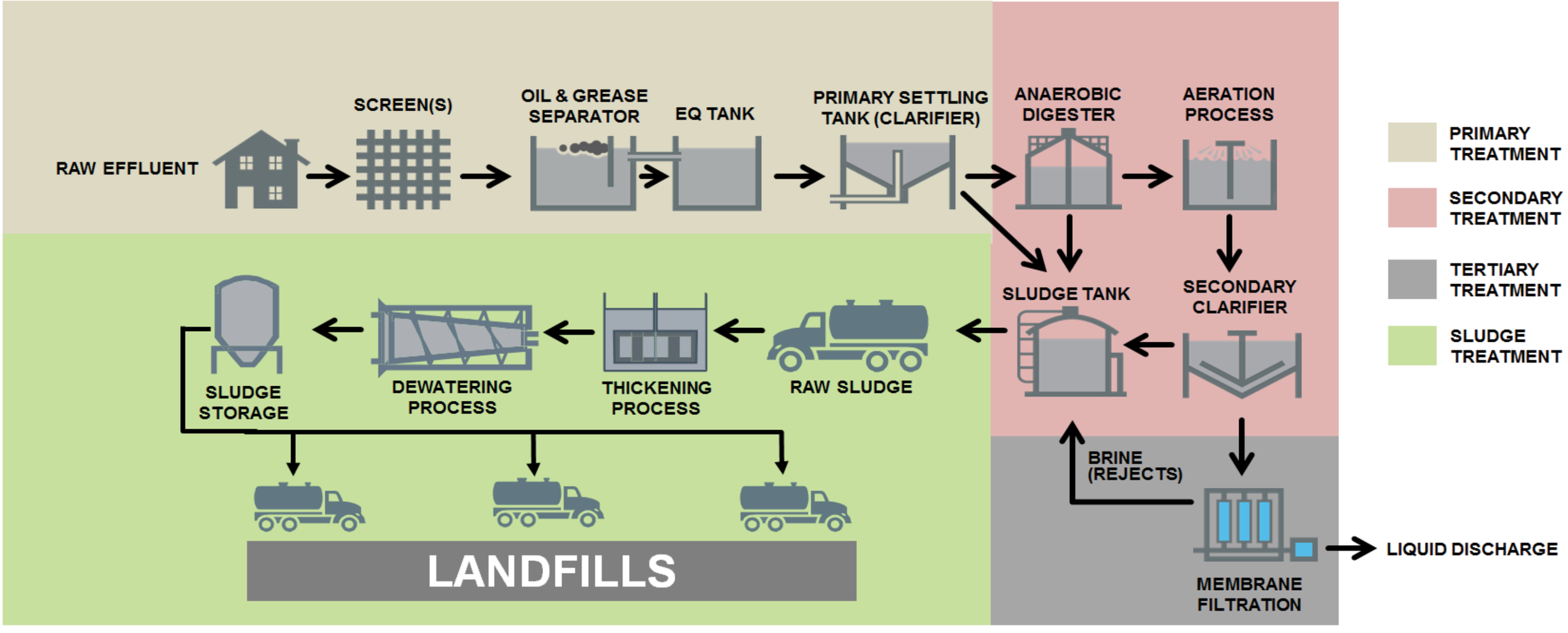
Clean water
back to ETP

Combustible solids
as boiler feed



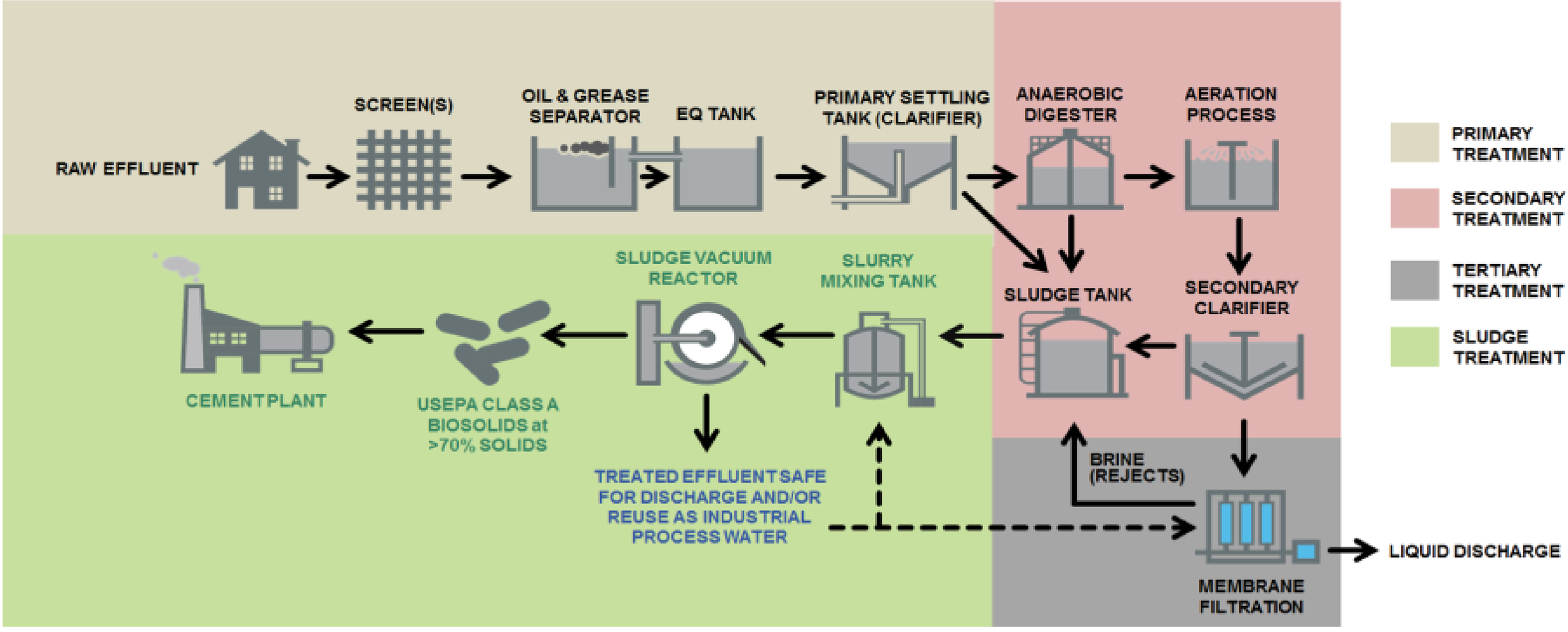
CURRENT SOLUTION

TYPICAL TREATMENT PROCESS



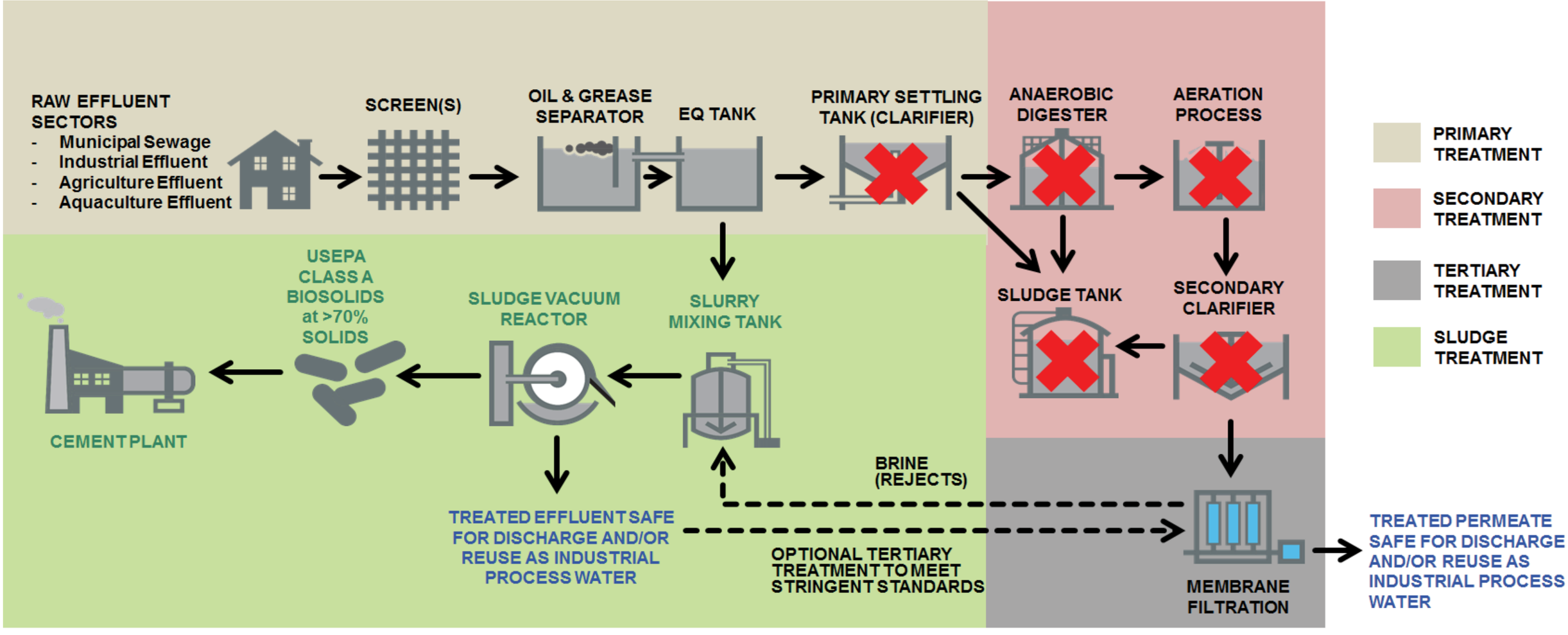
GGI SOLUTION - FIXED UNIT

GGI SLUDGE TREATMENT PROCESS



GGI SOLUTION - FIXED UNIT

GGI EFFLUENT TREATMENT PROCESS

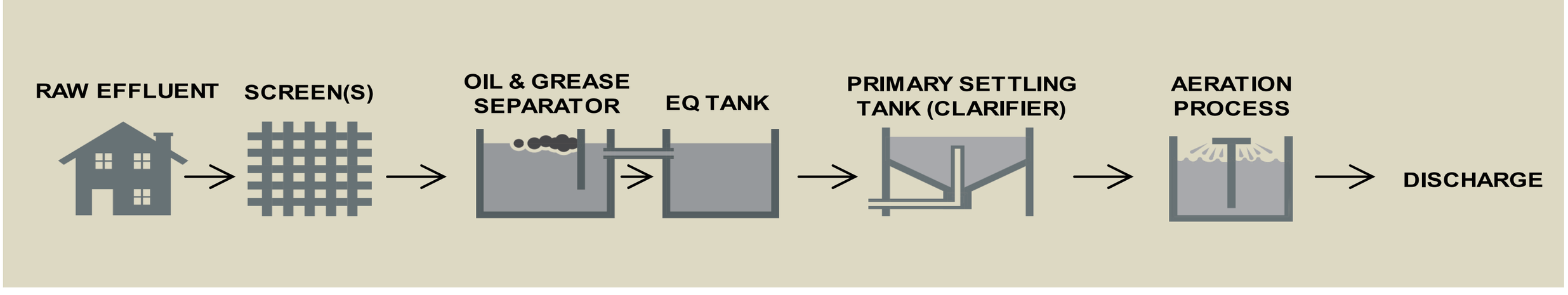


CURRENT SOLUTION

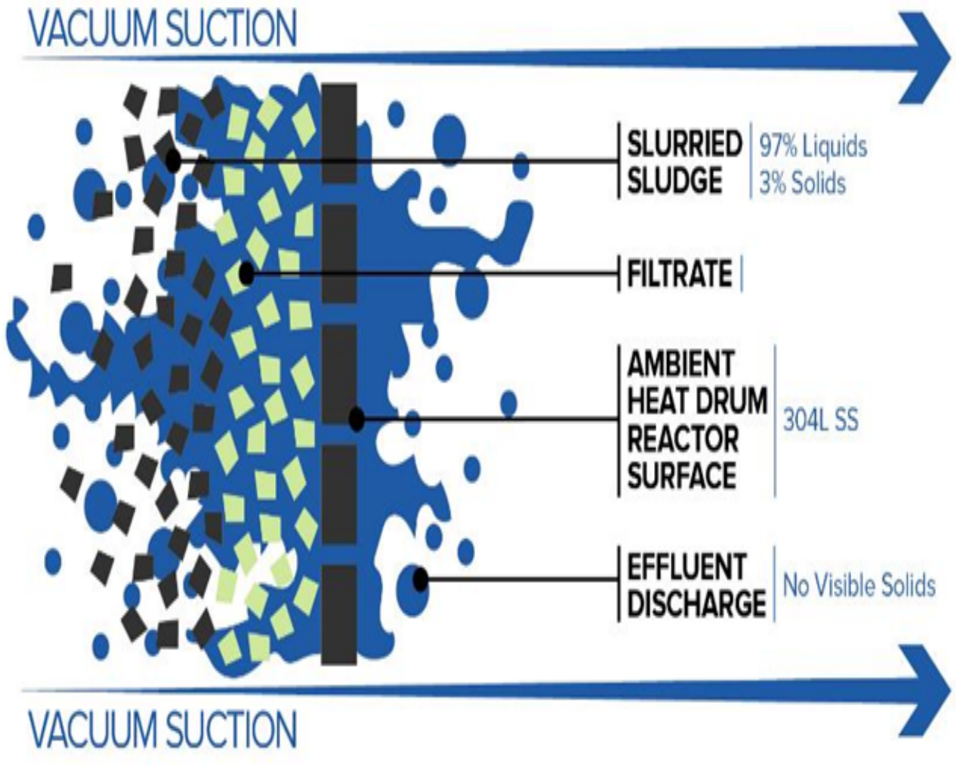
TYPICAL SMALL TREATMENT PROCESS

SMALL EFFLUENT & SLUDGE TREATMENT PROCESS

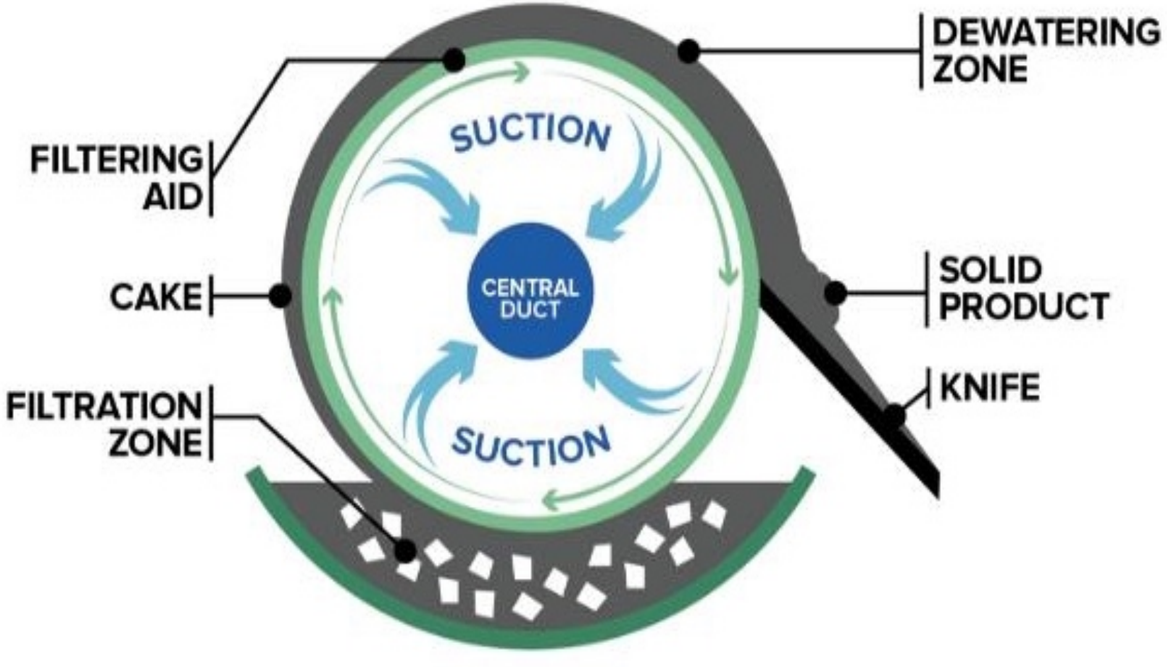
(PLANTS LESS THAN 10,000 PE)



Process Snapshots

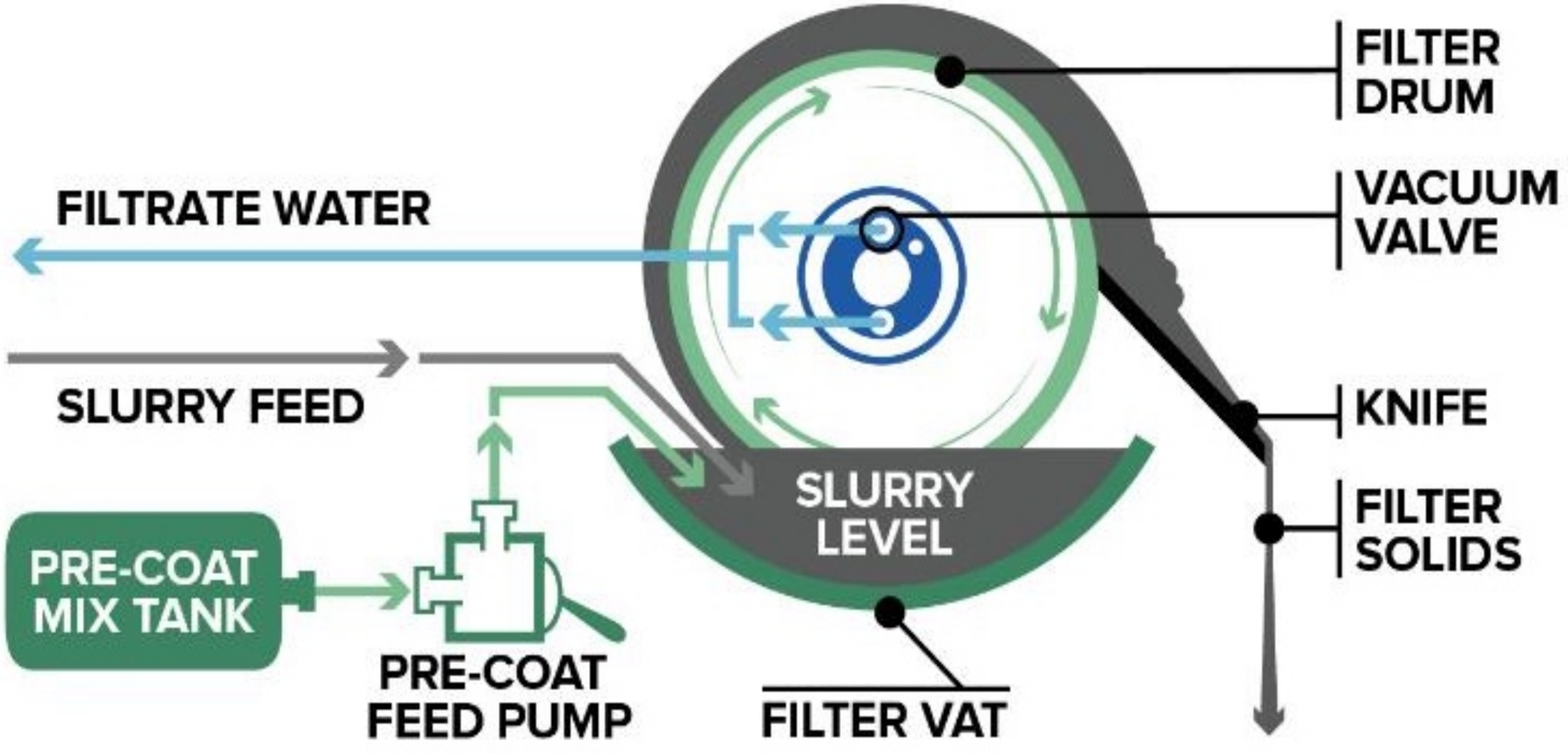


Micro level

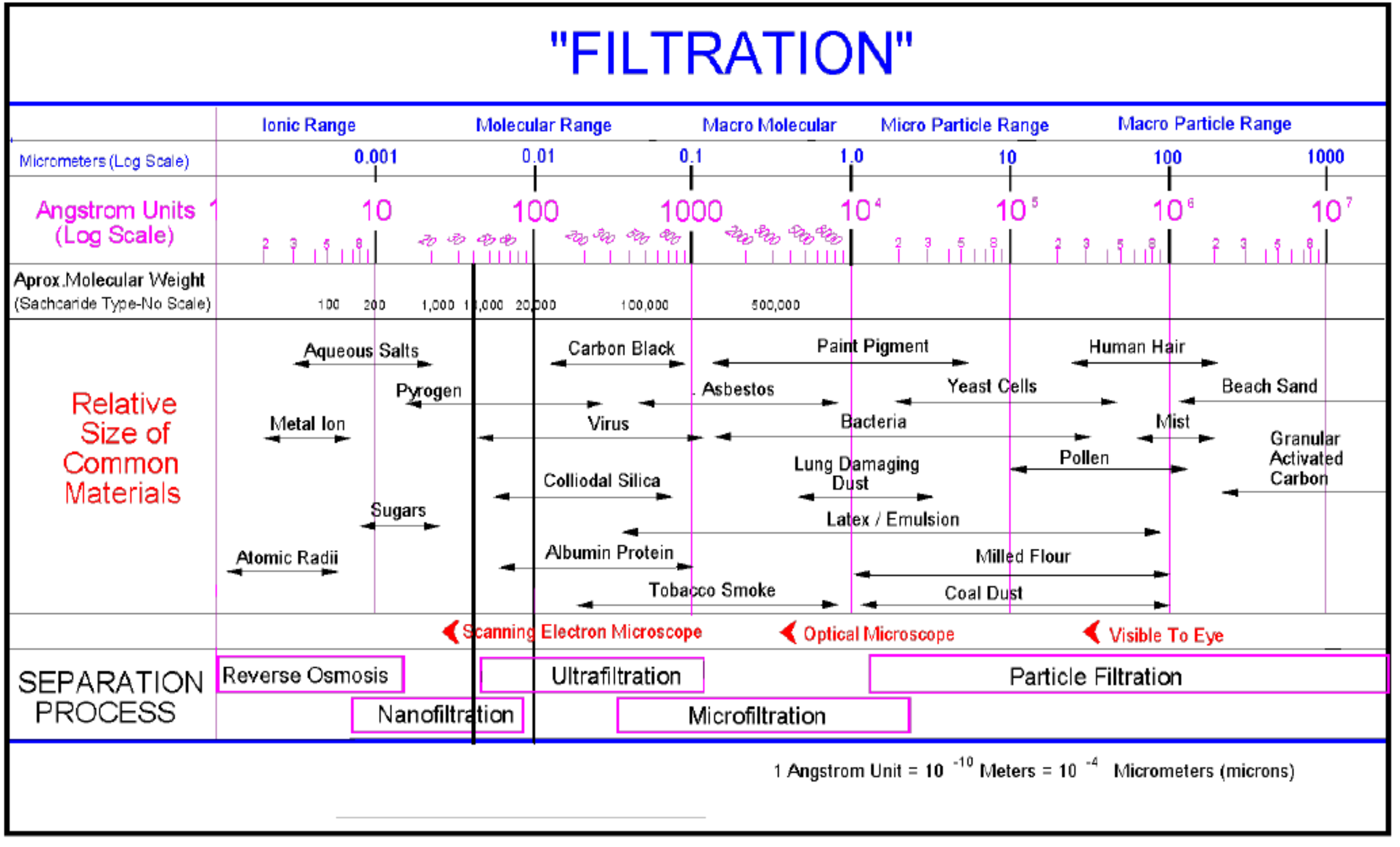


Macro level

GGI Process Flow



"FILTRATION"

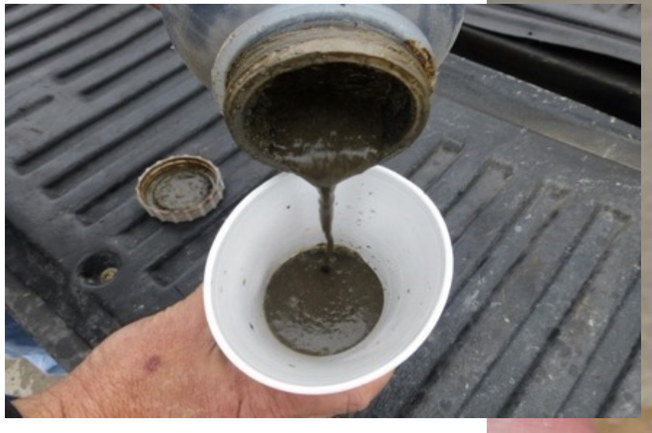

Ionic Range
Molecular Range
Macro Molecular
Micro Particle Range
Macro Particle Range
Micrometers (Log Scale)
0.001
0.01
0.1
1.0
10
100
1000
Angstrom Units (Log Scale)
10
100
1000
10^4
10^5
10^6
10^7
Aprox. Molecular Weight
(Sachcaride Type-No Scale)
100
200
1,000
10,000
20,000
100,000
500,000
Relative Size of Common Materials
Aqueous Salts
Carbon Black
Paint Pigment
Human Hair
Pyrogen
Asbestos
Yeast Cells
Beach Sand
Metal Ion
Virus
Bacteria
Mist
Granular Activated Carbon
Pollen
Lung Damaging Dust
Colliodal Silica
Sugars
Latex / Emulsion
Atomic Radii
Albumin Protein
Milled Flour
Tobacco Smoke
Coal Dust
Scanning Electron Microscope
Optical Microscope
Visible To Eye
SEPARATION PROCESS
Reverse Osmosis
Ultrafiltration
Particle Filtration
Nanofiltration
Microfiltration
1 Angstrom Unit = 10 -10 Meters = 10 -4 Micrometers (microns)

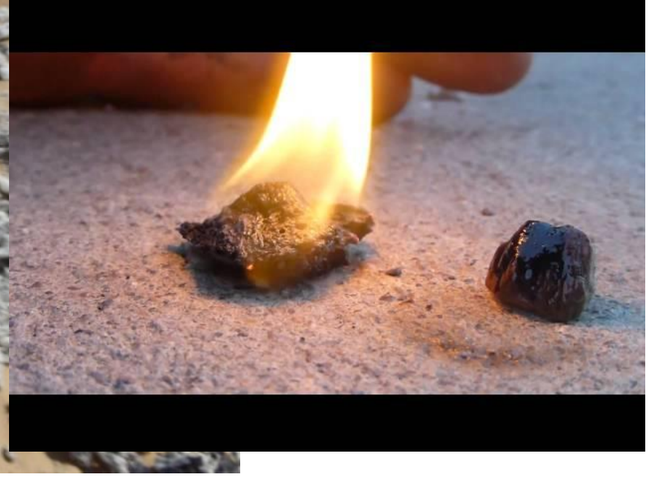

VIROMENT

Test Result – Treatment of Leachate from landfill

Pathogen Reduction Vector Reached

EPA vector is 90% solids for unstabilized and 75% solids for stabilized biosolids for Class A (safe)





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2616 East Broadway Ave. ~ Bismarck, ND 58501 ~ 800-279-6885 ~ Fax 701-258-9724
1201 Lincoln Hwy. ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com
MEMBER ACIL

Sample Number: 13-M2501

Report Date: 8/12/13

Paul Koenig
Azztec
8362 Tamarack Village #119-310
Woodbury MN 55125

Work Order #: 81-874

Date Collected: 8/ 1/13

Date Received: 8/ 9/13

Sample Description: IF4(2)
Sample Site: Discharge Cake

Sewage Sludge

PROXIMATE

ANALYTE	AS RECEIVED		DRY BASIS	
Total Moisture	8.44	wt. %		
Ash	16.94	wt. %	18.50	wt. %
Total Sulfur	0.43	wt. %	0.47	wt. %
Calorific Value BTU/lb	5850	BTU/lb	6389	BTU/lb

3,551 kcal/kg
14.86 Mj/kg

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MEMBER ACIL

Sample Number: 13-M2502

Report Date: 8/15/13

Paul Koenig
Azztec
8362 Tamarack Village #119-310
Woodbury MN 55125

Work Order #: 81-874

Date Collected: 8/ 1/13

Date Received: 8/ 9/13

Sample Description: CL3
Sample Site: Clarifier Sludge Cake

Animal Farm Sludge

PROXIMATE

ANALYTE	AS RECEIVED		DRY BASIS	
Total Moisture	1.59	wt. %		
Ash	9.87	wt. %	10.03	wt. %
Total Sulfur	0.71	wt. %	0.72	wt. %
Calorific Value BTU/lb	12029	BTU/lb	12224	BTU/lb

6,795kcal/kg
28.4 Mj/kg

Winner First Place Water Award at Global Cleantech Open Forum 2015

USA Patent & PCT

Advantages

- Real time mitigation of sludge (current dewatering & dry bed systems could take up to weeks)
- Lower moisture content at <20% (post dry bed process at >30%, post centrifuge process >70%)
- Flexible in-take point(s) (raw effluent, primary clarifier, secondary clarifier, digested, aerated, dewatered, dry bed and/or discharge)
- Zero discharge (close loop process flow)
- Clean water return for reuse as process water (up to 95% recovery)
- USEPA Vector A bio-solids at less than 20% moisture (available for internal boiler)
- No heavy investments (DBOO model requiring no capex from client – based on processing fees/ton)
- Substantial reduction on current sludge mitigation cost
- Reduction in raw feed cost
- Reduction in raw water cost
- Reduction in carbon footprint
- Guarantee on discharge/raw water parameters (depending on influent and discharge/raw water parameters)
- Small footprint
- Low power consumption and no polymer dosage

Moving Forward

- Understanding of current WWTP process flow and capacities
- Understanding of current sludge process flow and capacities
- Understanding of discharge standards and limitations
- Understanding of current operating cost for WWTP
- Understanding of current operating cost for sludge processing (including external cost)
- Understanding of power consumptions and chemicals usage
- Understanding of raw water (process water) standards or allowable limitations
- Understanding of boiler feed materials and cost
- Space allocations

THANK YOU

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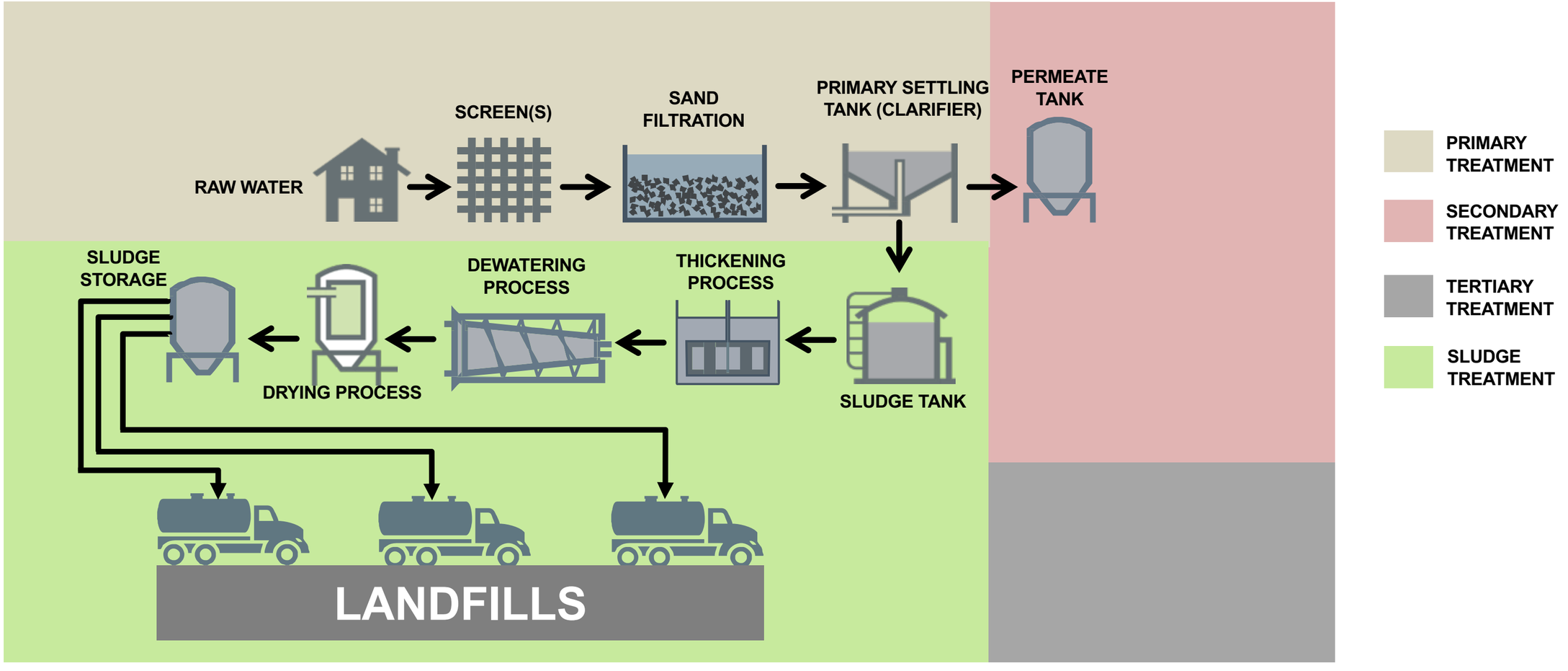
international

GGI TREATMENT PROCESS

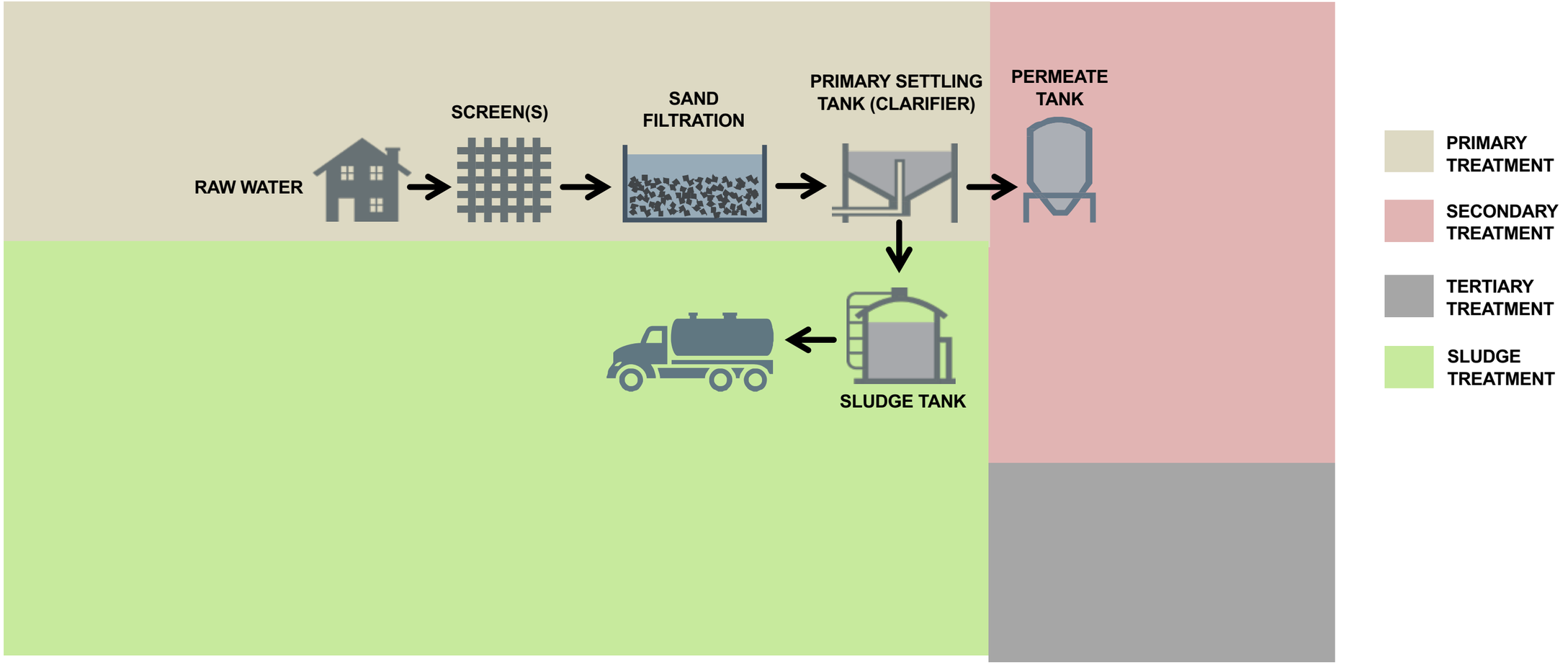
WATER TREATMENT PROCESS
POME TREATMENT PROCESS
PAPER & PULP TREATMENT PROCESS
RUBBER GLOVE TREATMENT PROCESS
SLUDGE TREATMENT PROCESS

WATER TREATMENT PROCESS

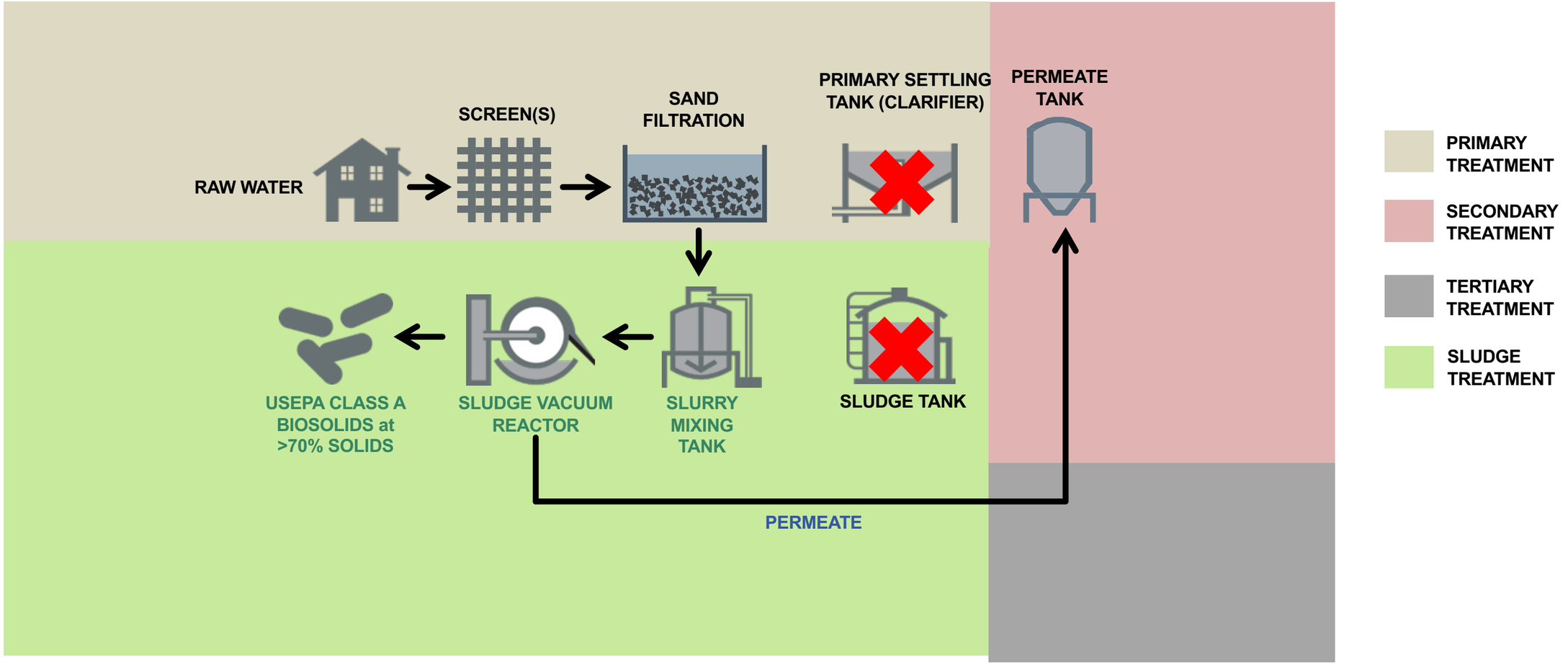
WATER TREATMENT PROCESS



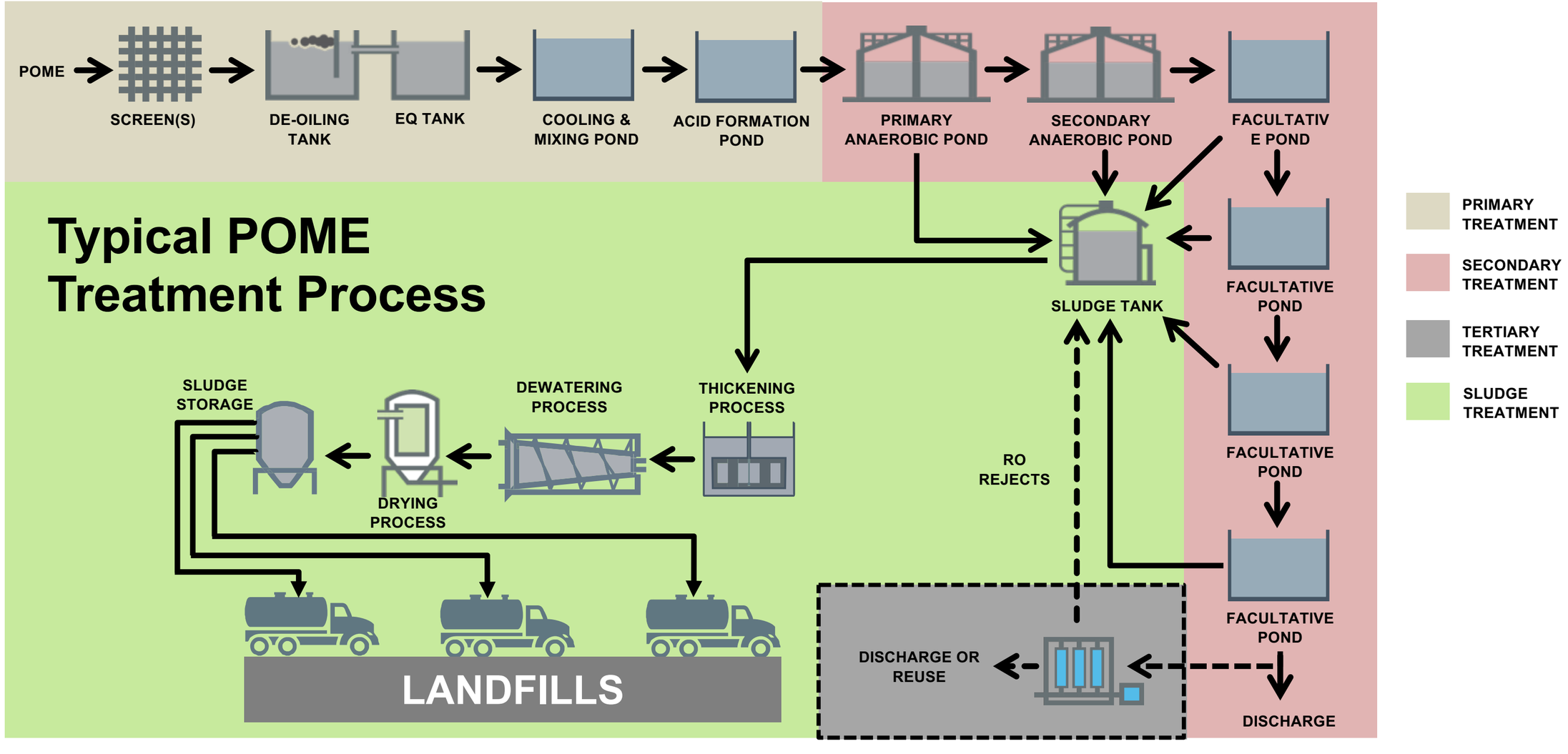
WATER TREATMENT PROCESS



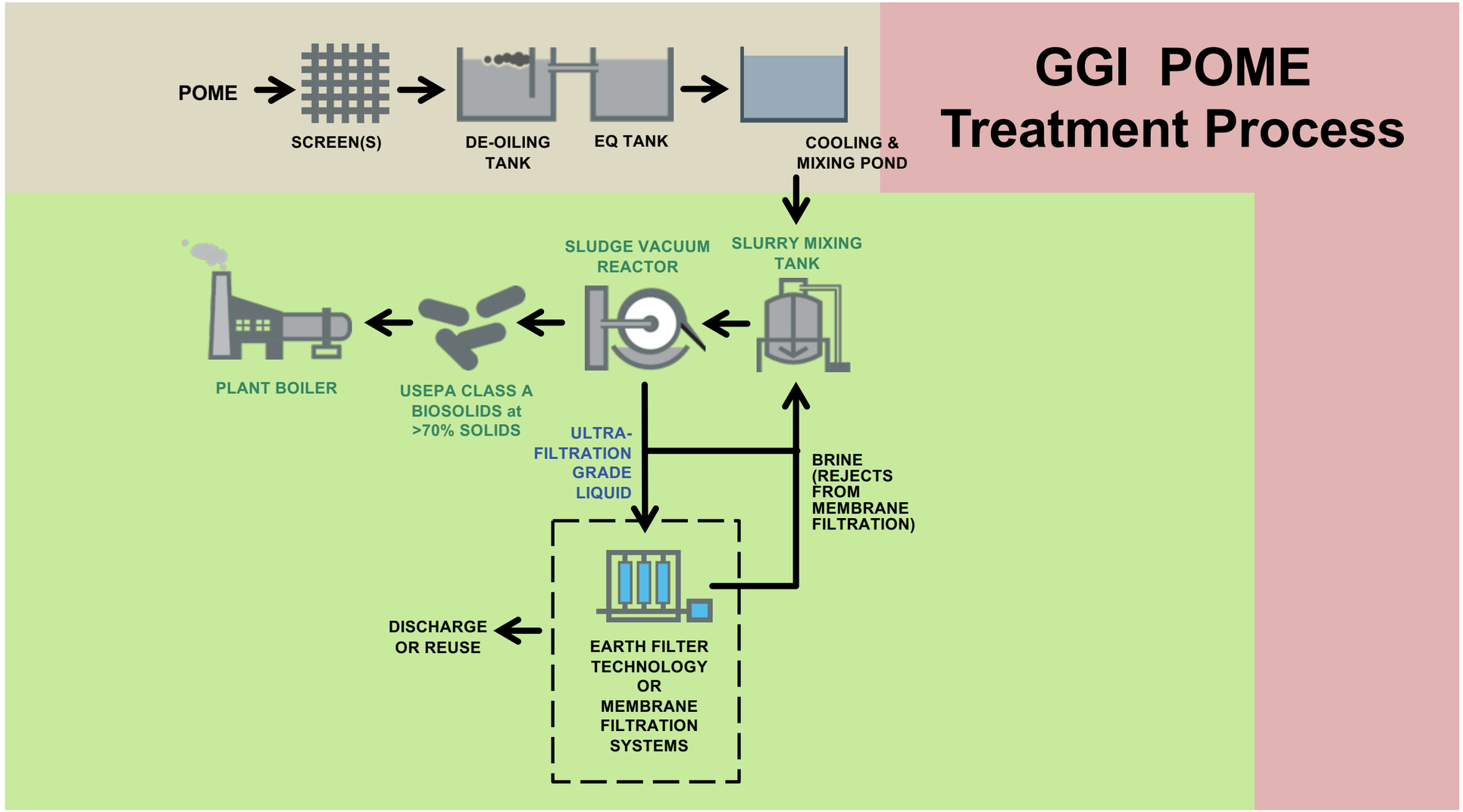
GGI WATER TREATMENT PROCESS



POME TREATMENT PROCESS

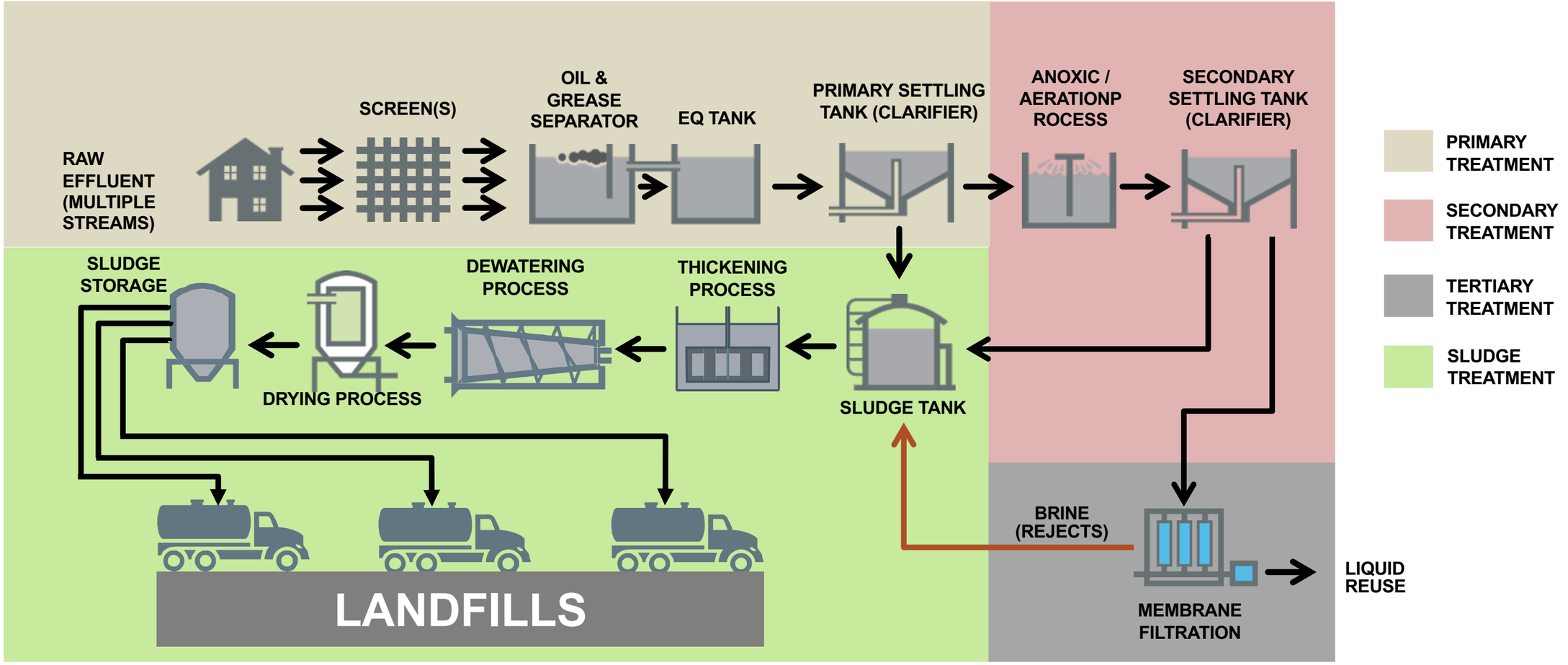

Typical POME Treatment Process
POME
SCREEN(S)
DE-OILING TANK
EQ TANK
COOLING & MIXING POND
ACID FORMATION POND
PRIMARY ANAEROBIC POND
SECONDARY ANAEROBIC POND
FACULTATIVE POND
FACULTATIVE POND
FACULTATIVE POND
FACULTATIVE POND
SLUDGE TANK
THICKENING PROCESS
DEWATERING PROCESS
DRYING PROCESS
SLUDGE STORAGE
RO REJECTS
DISCHARGE OR REUSE
DISCHARGE
LANDFILLS
PRIMARY TREATMENT
SECONDARY TREATMENT
TERTIARY TREATMENT
SLUDGE TREATMENT

GGI POME Treatment Process

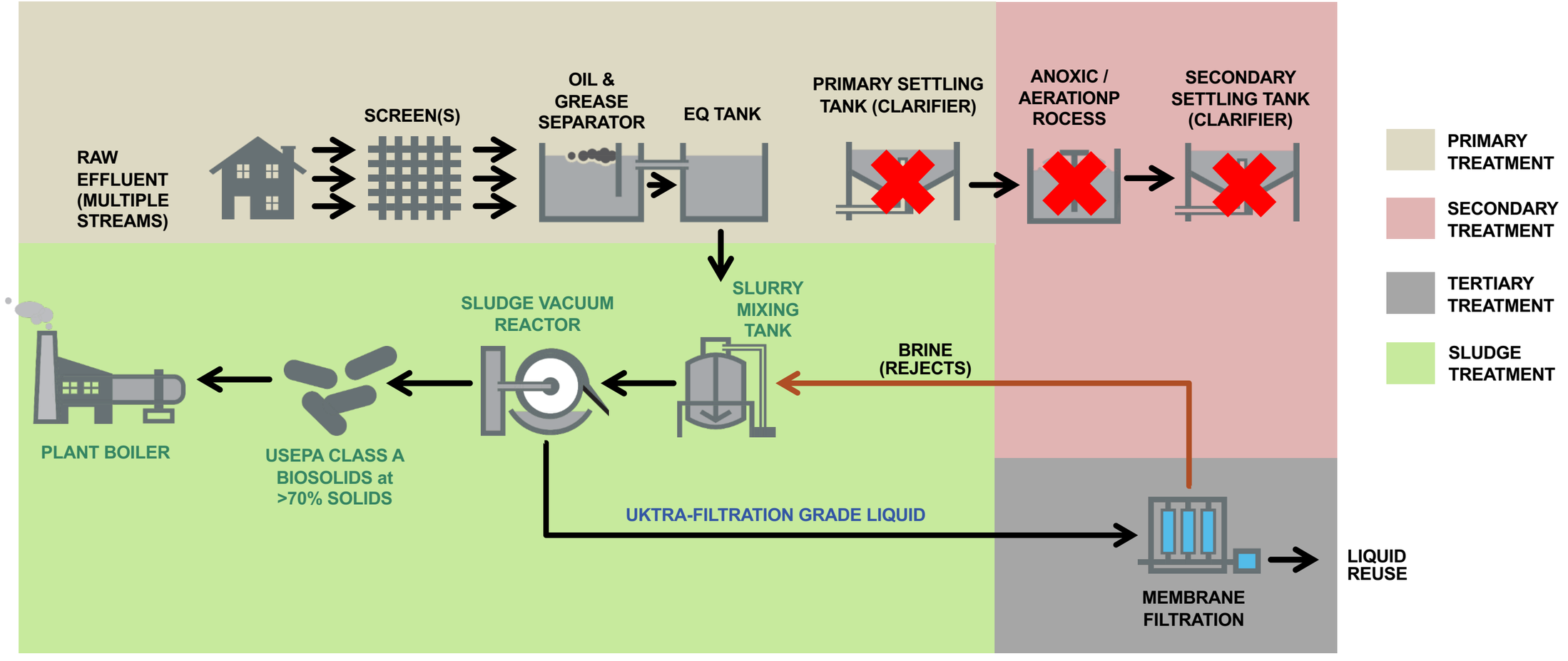


PAPER & PULP TREATMENT PROCESS

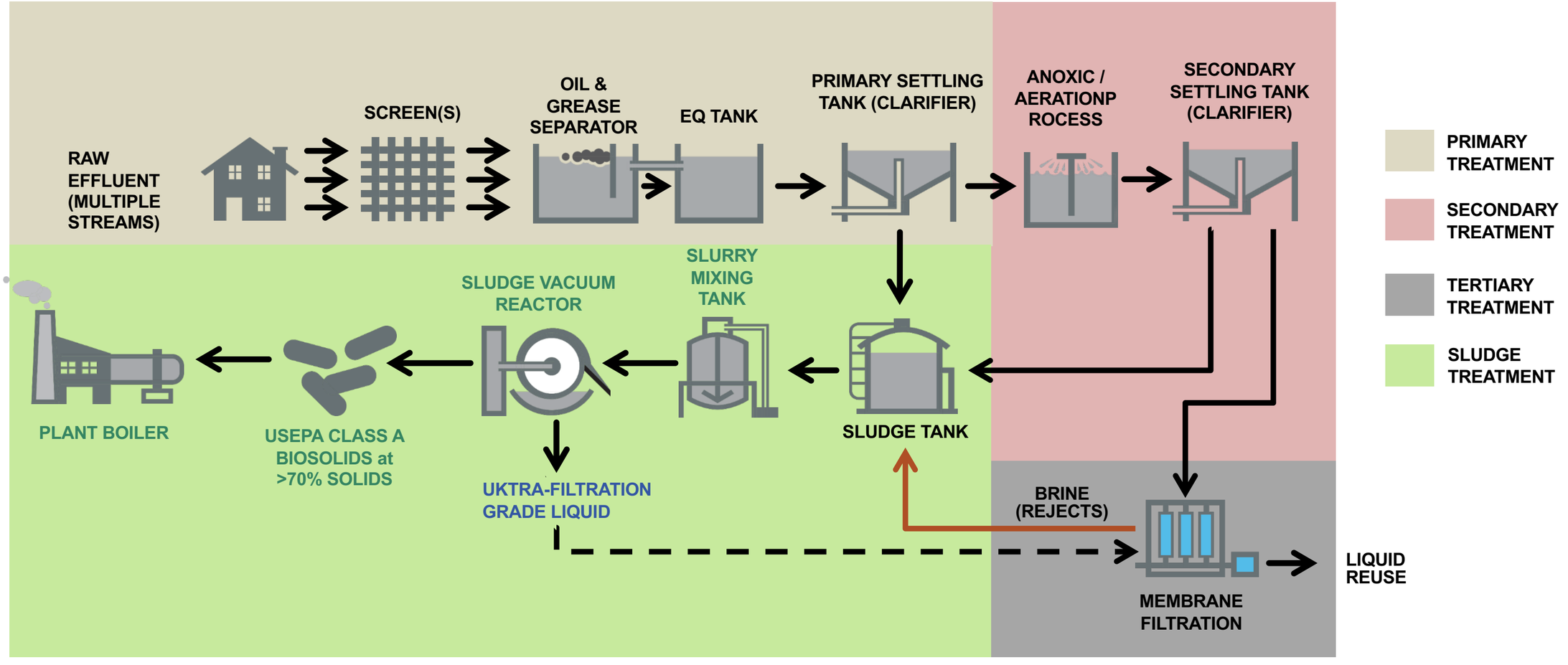
Typical Paper & Pulp Effluent & Sludge Treatment Process



GGI Paper & Pulp Effluent Treatment Process

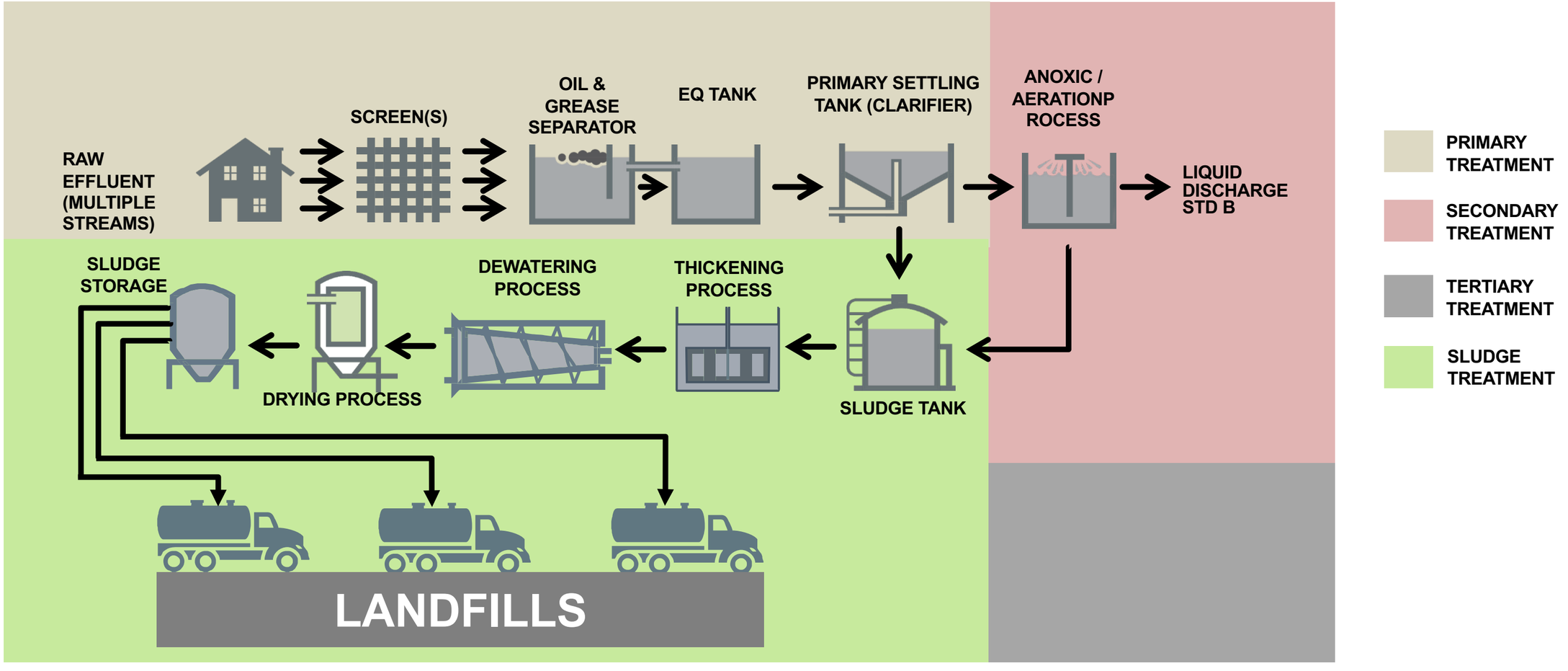


GGI Paper & Pulp Sludge Treatment Process

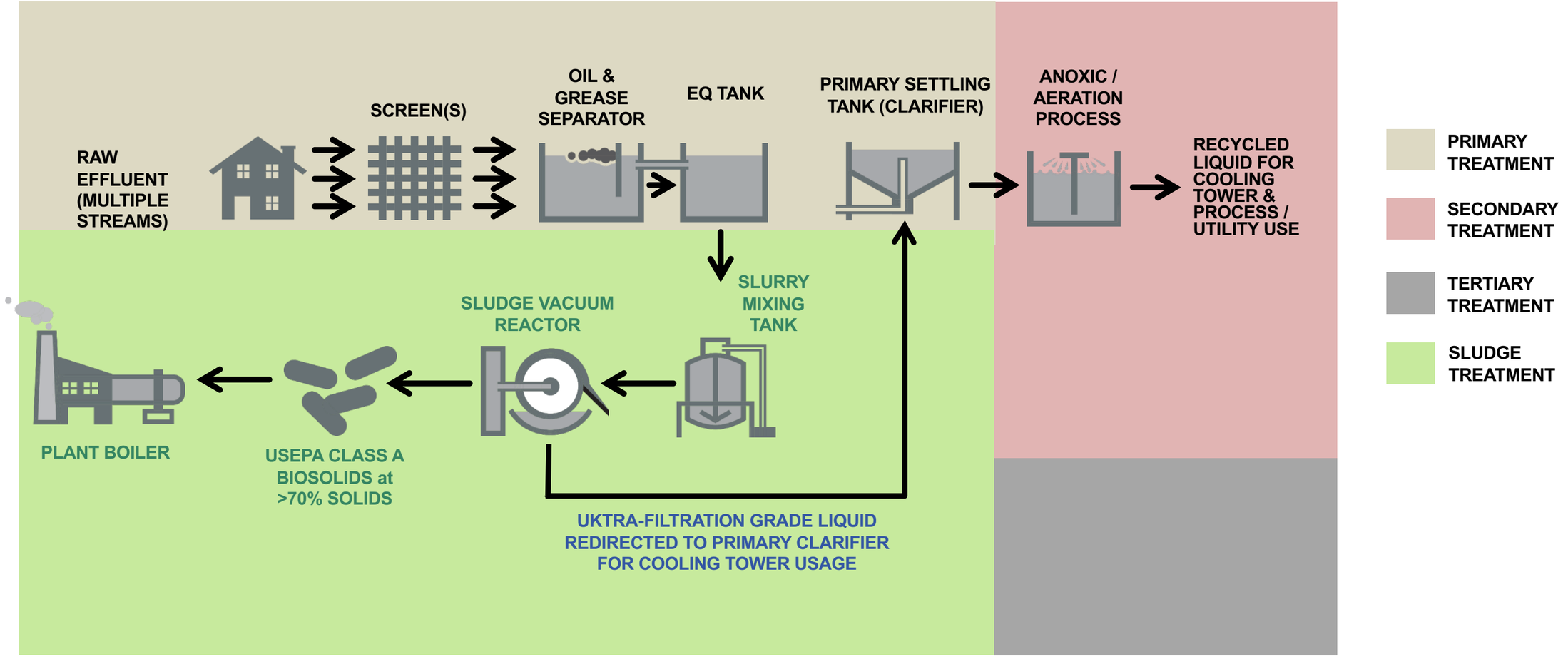


RUBBER GLOVE TREATMENT PROCESS

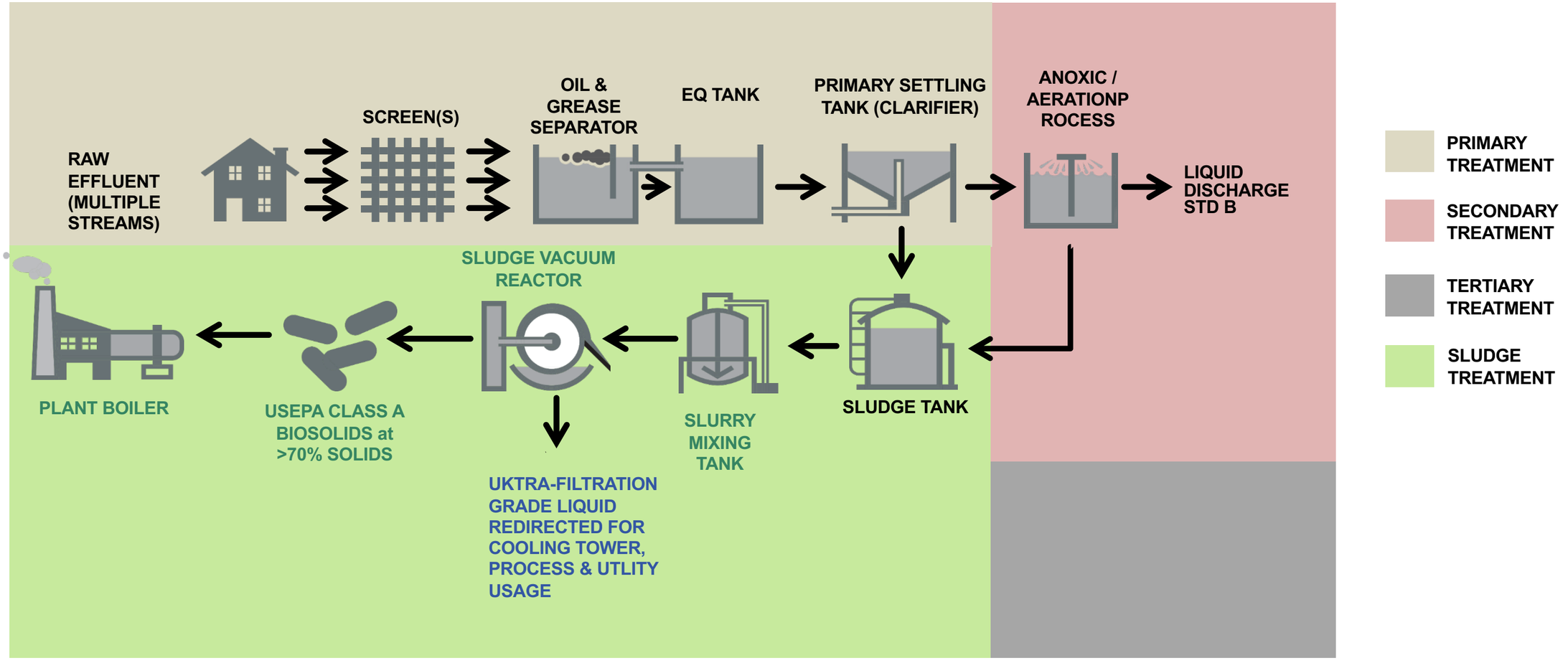
Typical Effluent & Sludge Treatment Process



GGI Effluent Treatment Process

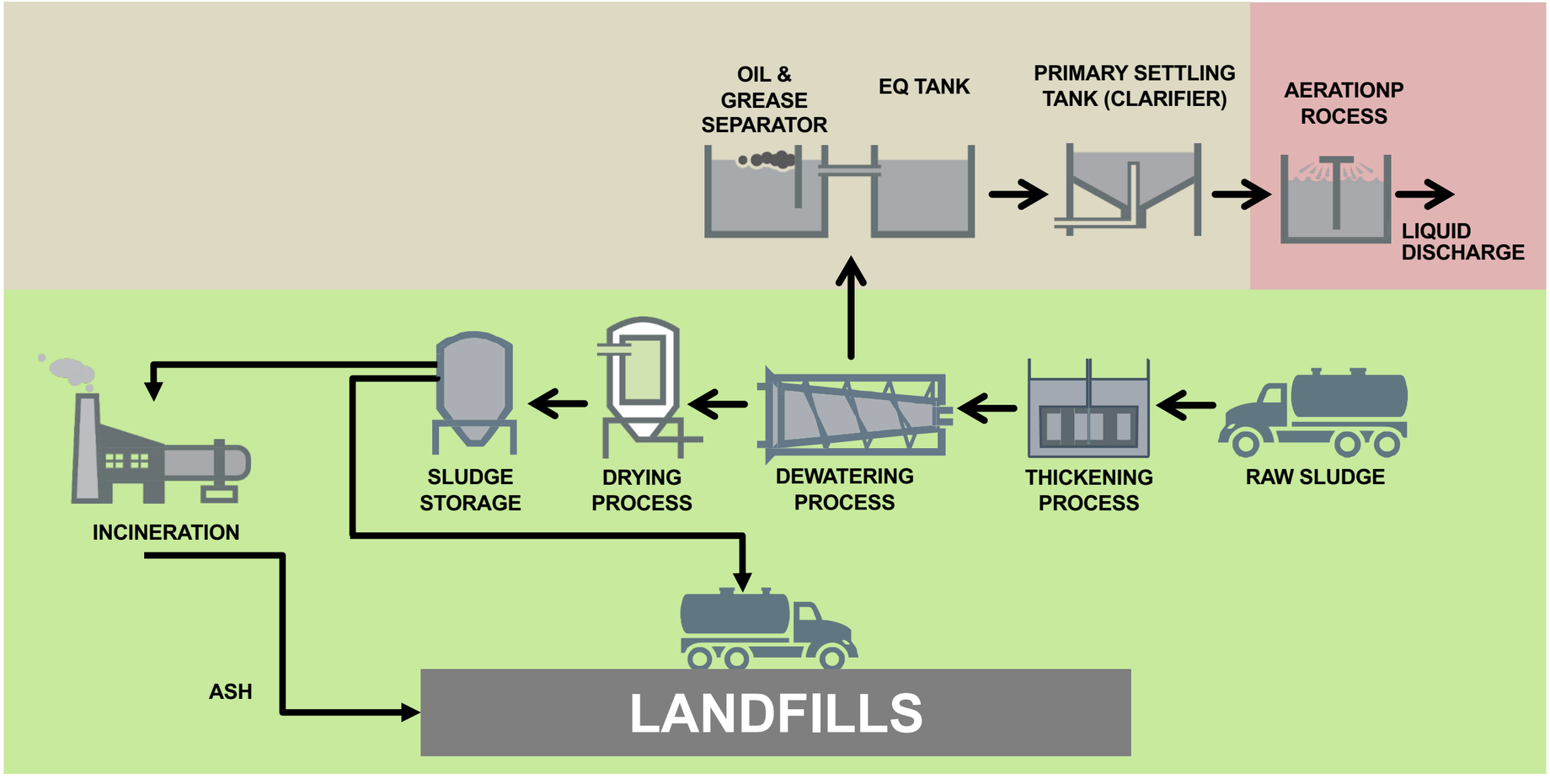


GGI Sludge Treatment Process

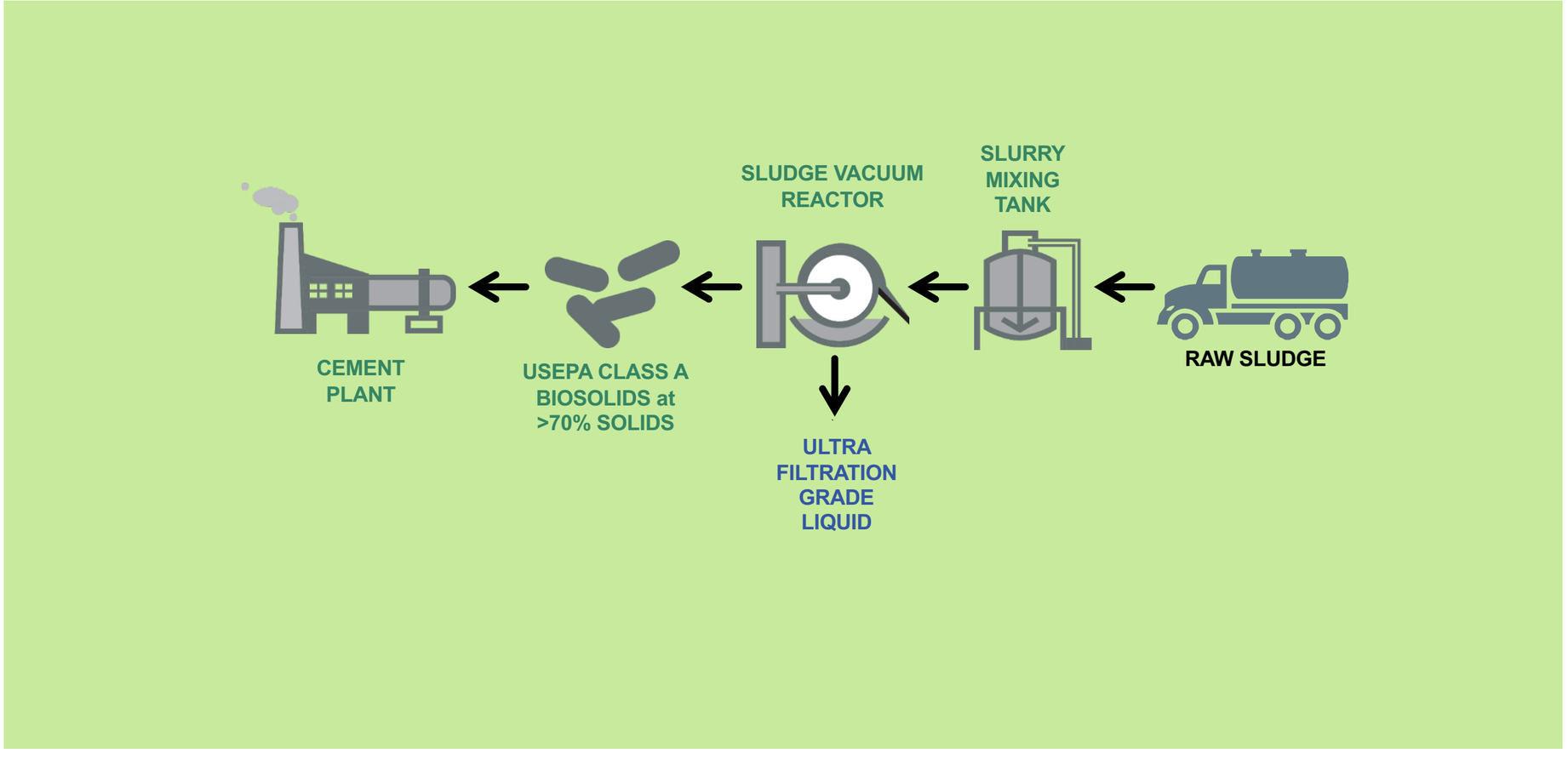


SLUDGE TREATMENT PROCESS

TYPICAL SLUDGE TREATMENT PROCESS



GGI SLUDGE TREATMENT PROCESS (FIXED UNIT)



GGI SLUDGE TREATMENT PROCESS (MOBILE UNIT)