



Welcome to the
Mat-Su Central

LANDFILL



CLARK
TECHNOLOGY

Landfill Leachate and Septage Treatment Waste-to-Energy Matanuska-Susitna Borough Solid Waste Division

Turning Liabilities into Rewards

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Creating a Sustainable Economic Engine

The Company

CLARK
ENGINEERING

- Over 80 years experience
- Licensed in 48 states, including Alaska
- Completed projects all over U.S. and on all seven continents



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Overview and Objective

- Mat-Su Borough pursuing a combined septage and leachate treatment facility.
- Location of facility is proposed at the Mat-Su Central Landfill.
- Current funding \$5M loan through DEC.
- We are here to provide cost-effective options to achieve leachate and septage treatment.
- Utilize septage as a part of waste-to-energy solution combined with MSW.

Presentation

Phase 1: Landfill Leachate Treatment

- The Technology
- Experience
- Notable Contaminants Removed
- Results
- Economics
- Next Steps

Presentation Overview

Phase 2: Septage Treatment

- The Project
- Performance
- Results
- Economics
- Next Steps

Presentation Overview

Phase 3: Waste-to-Energy

- The Problem
- The Recommendation and The Solution
- MSW Sorting Diagram
- Clark-Evergreen Patented AD and LEACHBUSTER[®] System
- Commercial AD Plant Examples
- The Process and the Benefits



Phase 1

LANDFILL LEACHATE TREATMENT

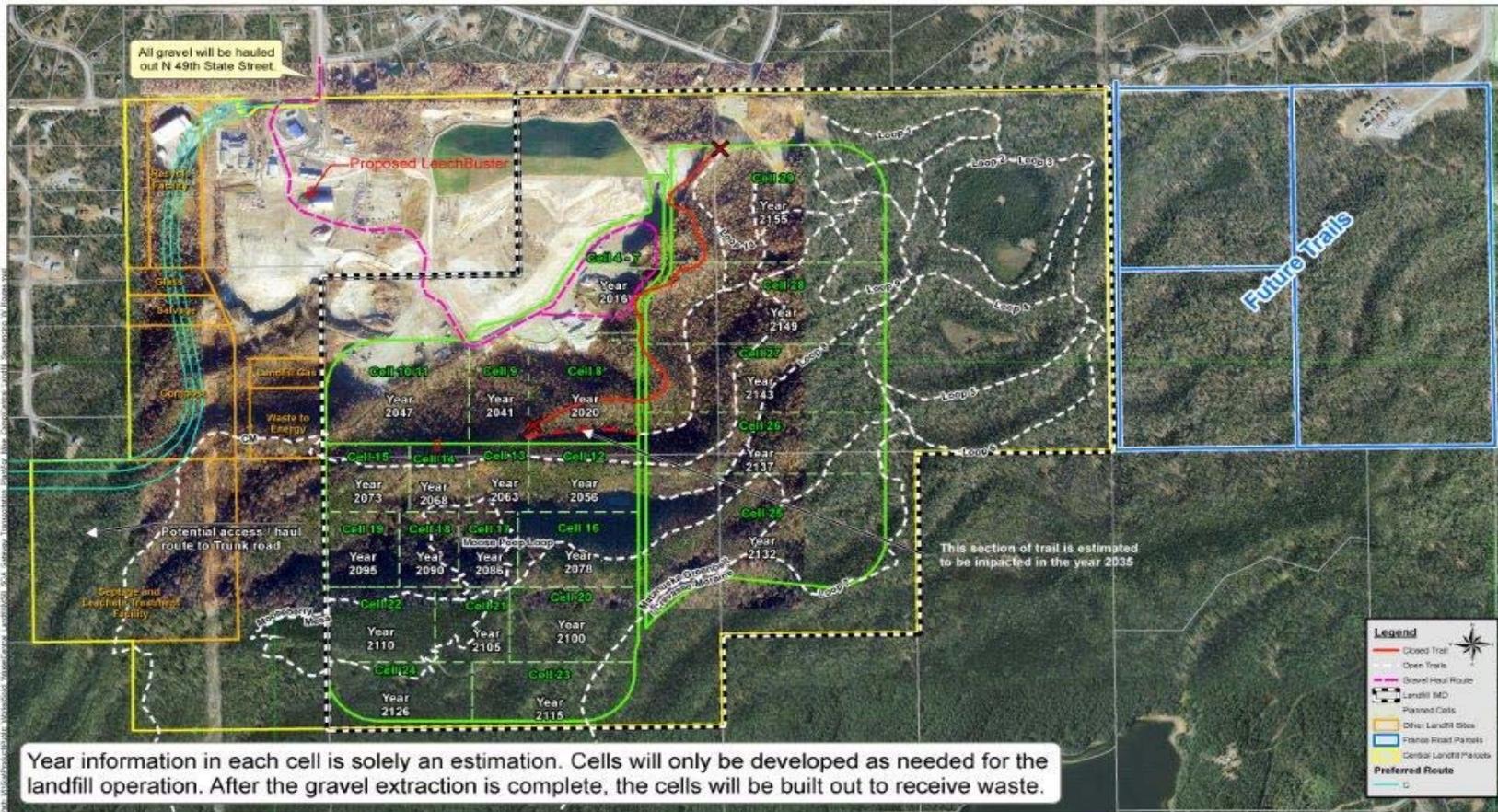


Objective

- Design and construct a system for separate treatment of:
 - Leachate generated by the Mat-Su Central Landfill.
 - Septage generated by the majority of Mat-Su Borough population from residential, commercial, and public entities.



The Project



System Location

The Project

Mat-Su Borough Leachate treatment system will have the following design parameters:

Waste Stream	Landfill Leachate
System Capacity (Gallons per Year)	1,400,000
Expandable to (Gallons per Year)	2,000,000
Treated Leachate Discharge	Subsurface Drain Field
Concentrated Leachate	Return to the open Landfill cell
Unit Dimensions	10ft x 14ft
Building Needs	25ft x 50ft
Power Requirements	100 amp, 80kW, 3 phase 460 v
Operator Requirements	1 to 2 hours per day

The Technology – Comparison



Clark
LEACHBUSTER®
Leachate
Treatment
System



MBR Leachate
Treatment System

The Technology and Experience

Clark LEACHBUSTER[®] Treatment System

- **70+ systems using this technology in operation treating:**
 - **Landfill Leachate**
 - **Septage**
 - **Municipal Wastewater**
 - **Industrial Wastewater**



➤ The Technology

- Clark has innovated and holds intellectual properties for various technologies
- Technologies provide a comprehensive solution for a wide range of water and wastewater treatment challenges
- The system offers up to 12+1 levels of treatment



The Technology

- At the heart of these technologies is LEACHBUSTER®
 - Innovative, state-of-the-art technology
 - Treats a wide range of waste streams with high solids content of up to 25%
 - No need for pre-filtration, pre-treatment, backwashing, or staging



The Performance

- Landfill leachate
- Septage and domestic wastewater





Notable Contaminants Removed

Pathogens without using disinfectants

- E-coli <2 CFUs/100 ml
- Fecal Coliforms < 10 CFUs/100 ml
- No THMs or DBPs

Volatile Organic Contaminants

- VOCs - TCE, DCE, MEK...
- SVOCs
- PAHs

Emerging contaminants of concern

- PFCs,
- Boron,
- Chlorides...



Results

Physical indicators

- Organics BOD, TSS, and COD
- Inorganics TDS and TS
- Metals Cd, Cr, Cu, Pb, Se, Sb
- Conductivity

Common contaminants

- Phosphorus
- Nitrogen compounds, NO_x , NH_3
- Sulfates
- Bromides

Tomorrow's contaminants

- Antibiotics
- Degradation byproducts
- Endocrine prohibitor
- Super bugs

Results

Raw Leachate and Treated Leachate Characterization

Parameters	Raw	Treated	% Removal
BOD (mg/l)	>14000	0	100
COD (mg/l)	>30000	30	99.9
pH	7-8.5	7	-
Temperature	65 to 75	80-90	-
Ammonia	>400	<10	99
TDS (mg/l)	>5000	<100	99.9
TSS (mg/l)	>2000	0	100
Total Coliforms (CFUs/100ml)	>7 logs	0	100
E-Coli	>5 logs	<2	99.9

Results

PFCs

Amount of contaminants in raw leachate, treated effluent, and concentrate together with ILs and HRLs.

Analyte	Raw Leachate	Treated Leachate	HRLs ³	Removal (%)	Units
Perfluoropentanoic Acid	ND	ND		ND	ng/l
PFBS	680	ND	7000	100.00	ng/l
Perfluorohexanoic Acid	8300	ND		100.00	ng/l
Perfluoroheptanoic Acid	3200	ND		100.00	ng/l
PFHxS	2600	ND	7000	100.00	ng/l
PFOA	4500	ND	300	100.00	ng/l
Perfluorononanoic Acid	ND	ND	300	ND	ng/l
PFOS	1100	ND	300	100.00	ng/l
Perfluorodecanoic Acid	ND	ND		ND	ng/l
Perfluoroundecanoic Acid	ND	ND		ND	ng/l
Perfluorododecanoic Acid	ND	ND		ND	ng/l



Phase 2

SEPTAGE TREATMENT



The Project

Waste Stream	Septage from Septic Tanks
System Capacity (Gallons per Year)	14,000,000
Expandable to (Gallons per Year)	20,000,000+
Treated Leachate Discharge	Subsurface Drain Field
Concentrated Leachate	Dewatered and land applied
Unit Dimensions	2 @ 10ft x 14ft
Housing Dimensions (Building)	25ft x 60ft
Power Requirements	250 Amp, 200kW, 3 phase 460 v
Operator Requirements	2 to 3 hours per day
Volume Reduction	95% to 98%

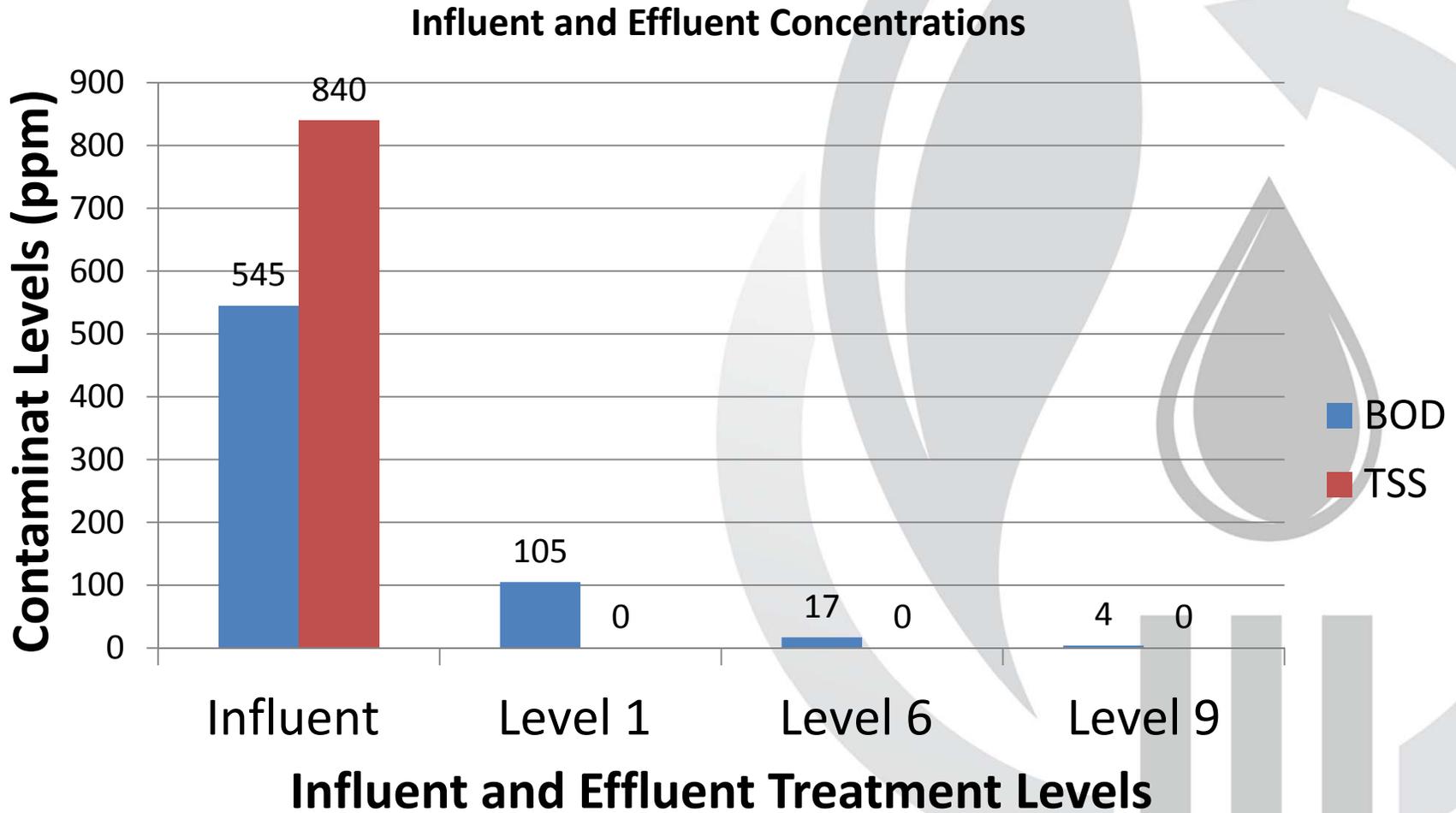
➔ Performance

- LEACHBUSTER[®] was applied to treat municipal wastewater (sewage) and septage





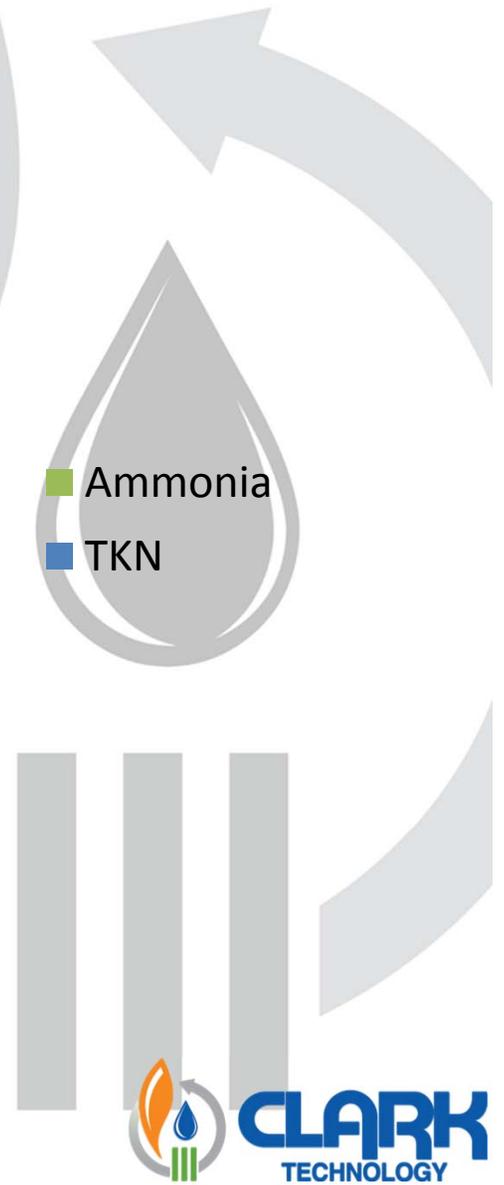
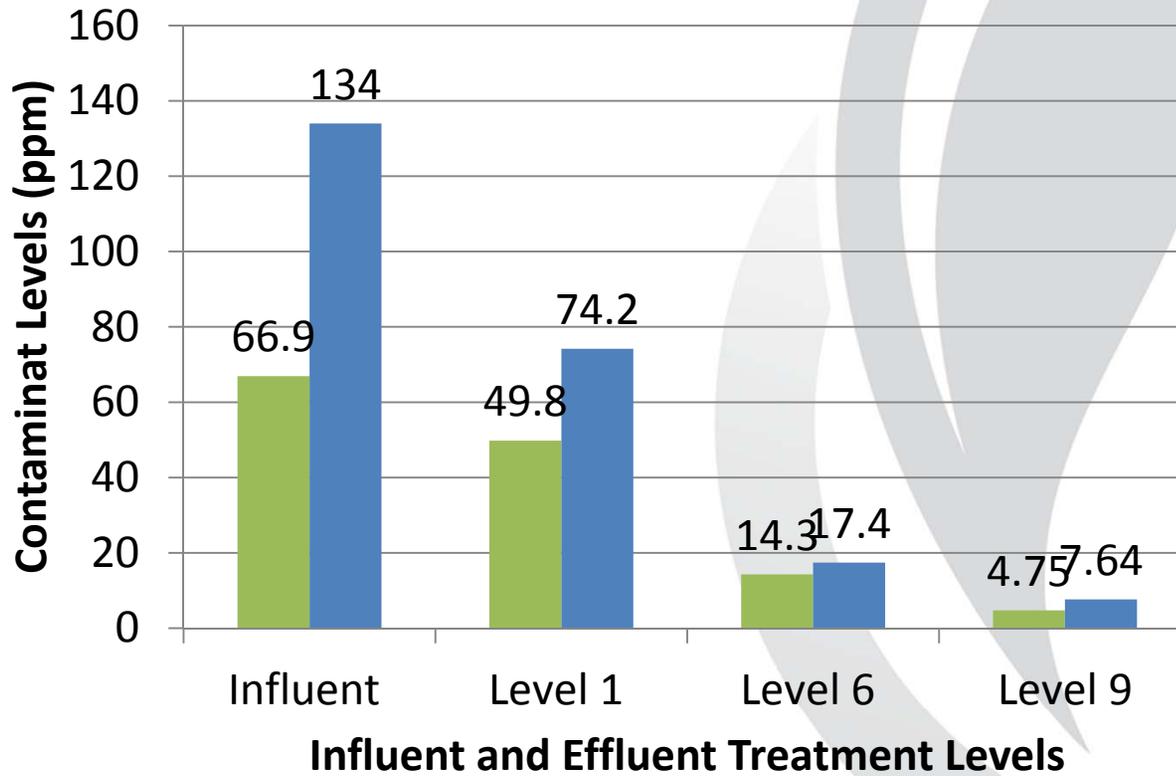
Results





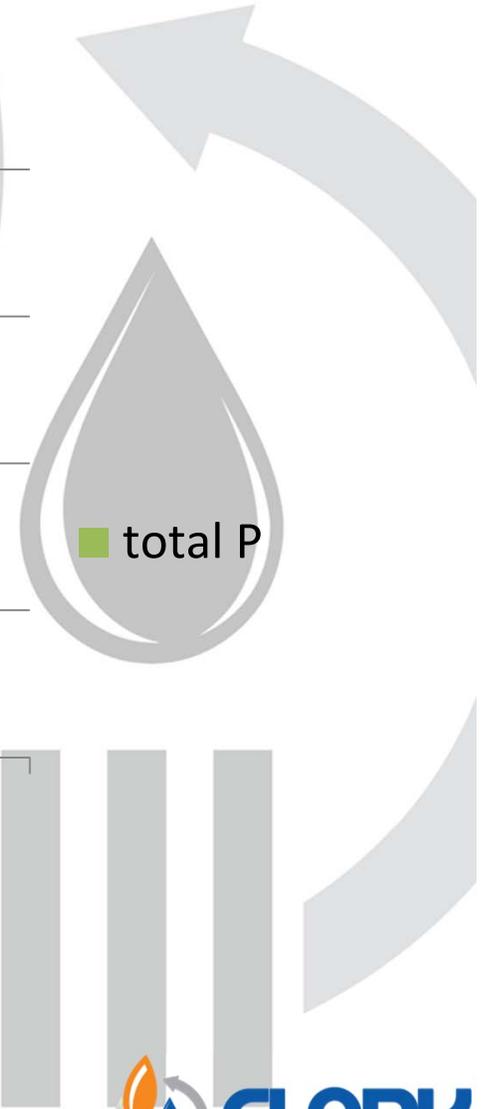
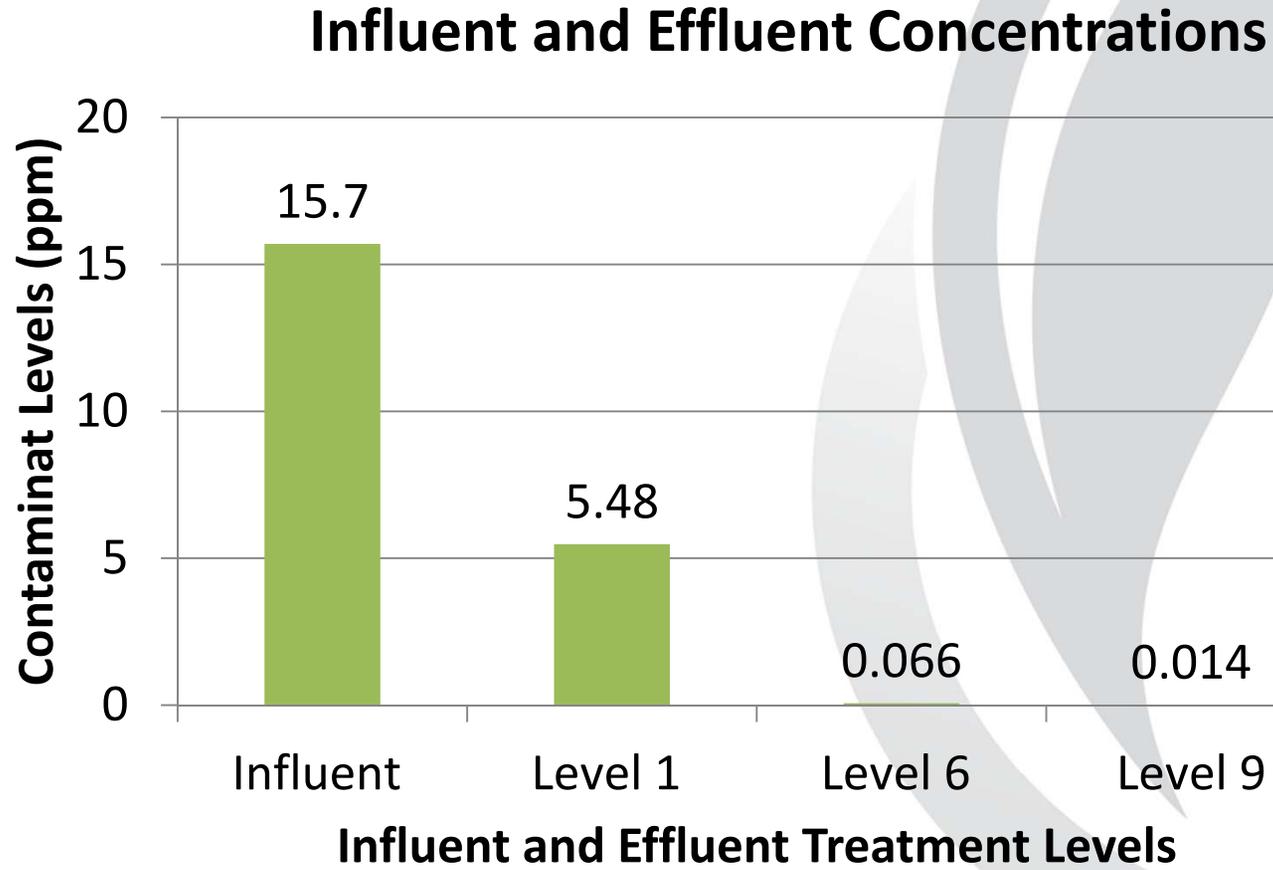
Results

Influent and Effluent Concentrations





Results

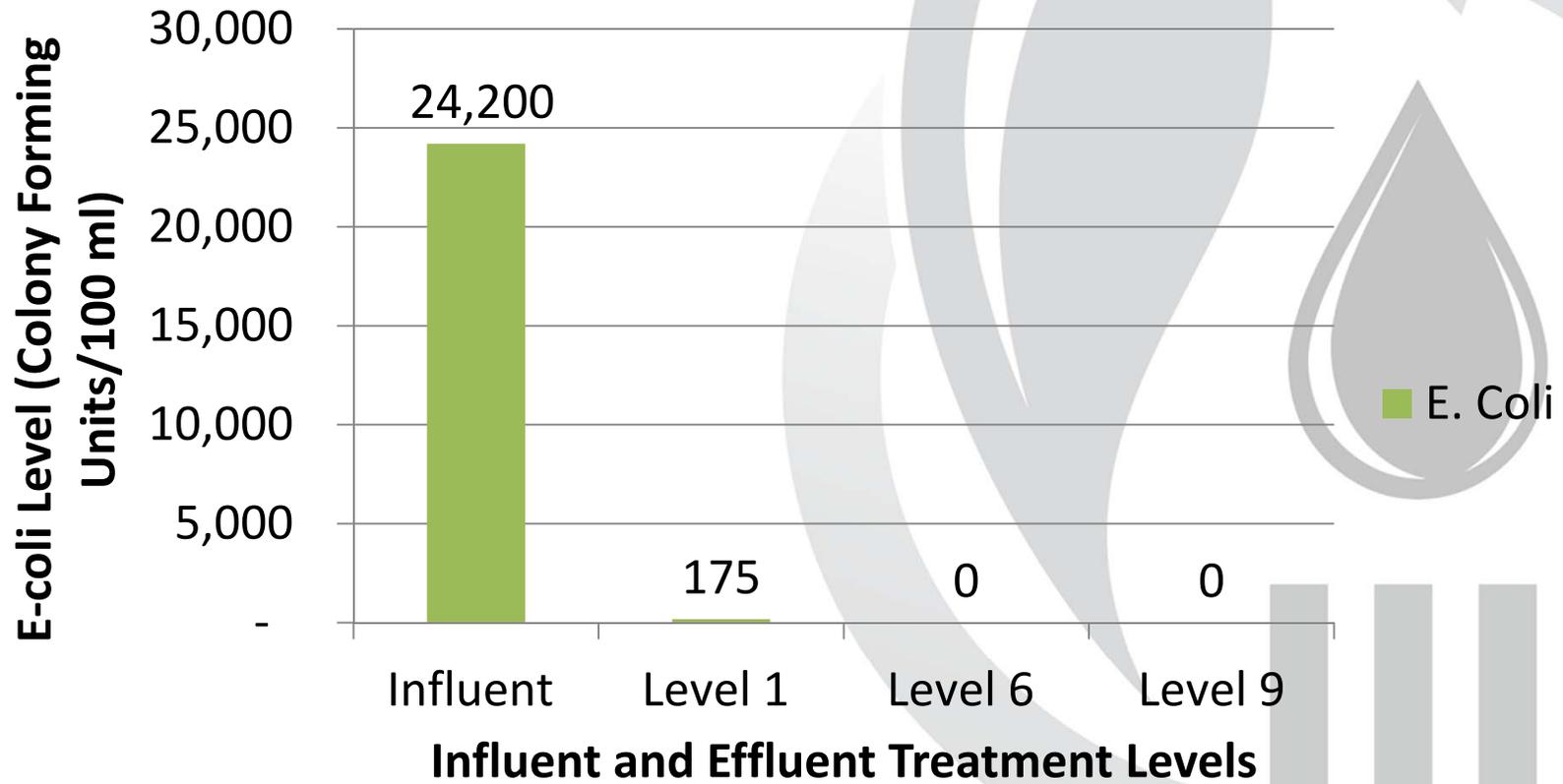


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Results

Influent and Effluent Concentrations



Economics

- Rough order of magnitude (ROM) pricing on a few options for consideration by Mat-Su Borough
- Revised pricing will be provided after completion of a directed engineering study

Economics

- Landfill leachate treatment
 - Landfill leachate treatment system is expandable to accommodate the inclusion of the septage treatment system
- Septage treatment system

Economics – Landfill Leachate Treatment

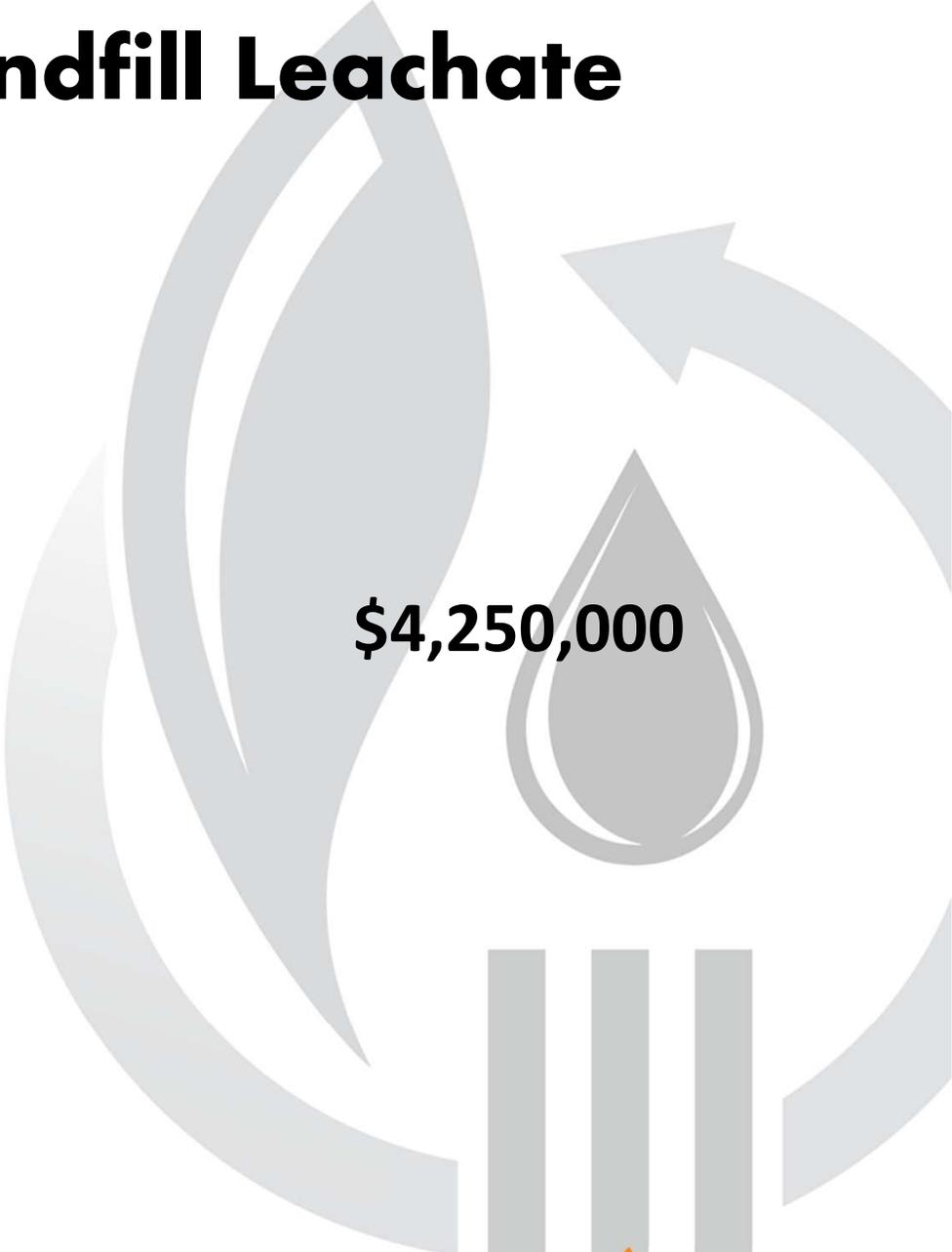
The proposed system will treat only the landfill leachate without any provision to accommodate the treatment of septage.

- The system will be designed to treat initially 1,400,000 gallons of leachate per year during approximately 6 months.
- The system will be expandable to treat up to 2,000,000 gallons of leachate/year during that period.
- The system will consist of three modules, which can be brought into service to respond to varying demand.
- For example, one module can run during the winter, two in spring, and all three during the summer and fall when the rainfall is high.

Economics – Landfill Leachate Treatment

The ROM pricing for the system is:

- Treatment system skid, including:
 - Design, engineering, manufacturing, transportation, installation, commissioning, and training.
 - Building to accommodate the treatment system and site work related to the building's leachate tanks' internal and external piping and electric work.



\$4,250,000

Economics – Septage Treatment

The proposed system will treat only the septage:

- The system will be designed to treat initially 14,000,000 gallons of septage per year during approximately 6 months.
- The system will be expandable to treat up to 20,000,000 gallons/year of septage during this period.
- The system can be designed for an additional cost to accommodate wastewater from the cities of Palmer and Wasilla also.

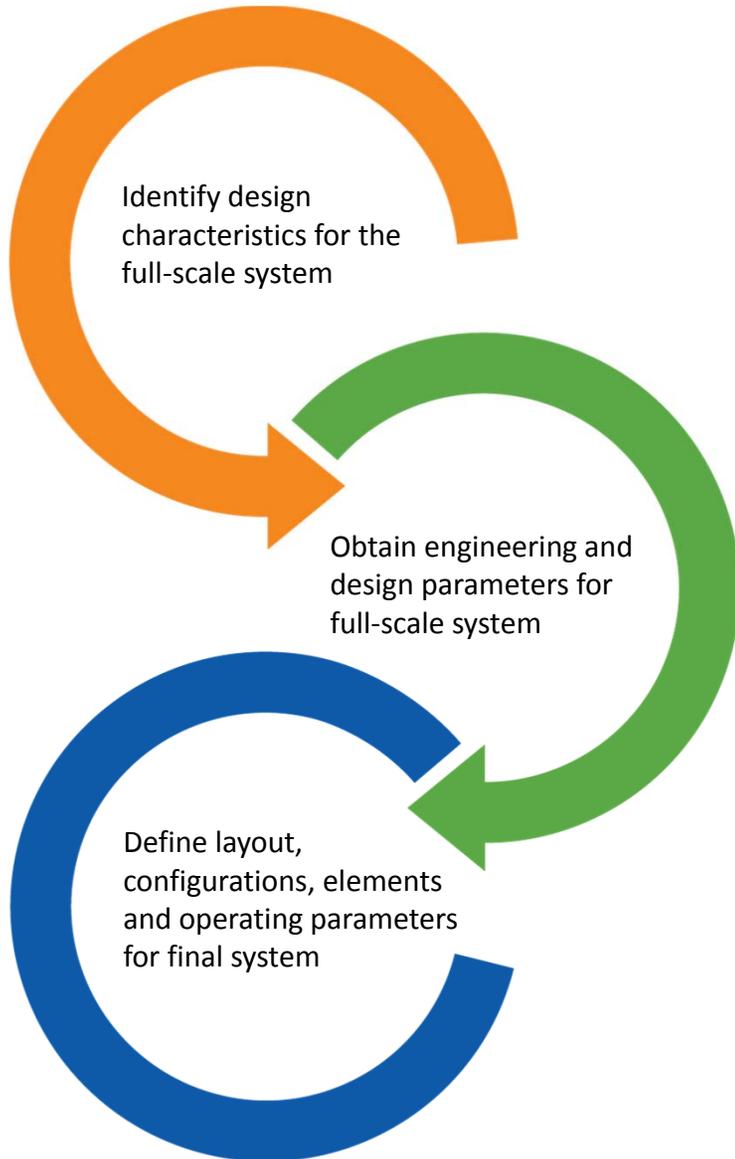
Economics – Septage Treatment

The ROM pricing for the system is:

- Treatment system skid including:
 - Design, engineering, manufacturing, transportation, installation, commissioning, and training.
 - Building to accommodate the treatment system and site work related to the building's internal and external piping and electric work.

\$7,640,000

Next Steps – Directed Engineering and Parametric Design Study





Phase 3

WASTE-TO-ENERGY

**A NEW VISION: INTEGRATED WASTE MANAGEMENT,
RESOURCE RECOVERY, AND RENEWABLE ENERGY SYSTEM
(A THRIVEABLE SOLUTION)**



Large and Inefficient



Large and Inefficient





The Problem

We need a paradigm shift.

**There is a better way to treat
solid and liquid waste.**



The Recommendation

Employ robust technologies.

Clark-Evergreen integrated waste management and waste-to-energy conversion system.



The Recommendation

- Clark-Evergreen integrated waste management and waste-to-energy conversion system
 - An efficient means of reducing the volume of MSW and sewage
 - Convert waste into valuable products and by-products: biogas or green electric power, organic fertilizer, clean water

The Recommendation

- Clark-Evergreen integrated waste management and waste-to-energy conversion system
 - Significantly reduce waste storage issues and associated air and water pollution
 - Significantly reduce capital and operating costs

The Recommendation

- Clark-Evergreen integrated waste management and waste-to-energy conversion system

**Convert liabilities into assets:
create an income stream in
addition to tipping and
treatment fees.**



The Solution

Recycle. Convert. Renew. Thrive.

Integrated waste-to-energy conversion system is the gift that keeps on giving, thanks to the valuable products and by-products it produces.



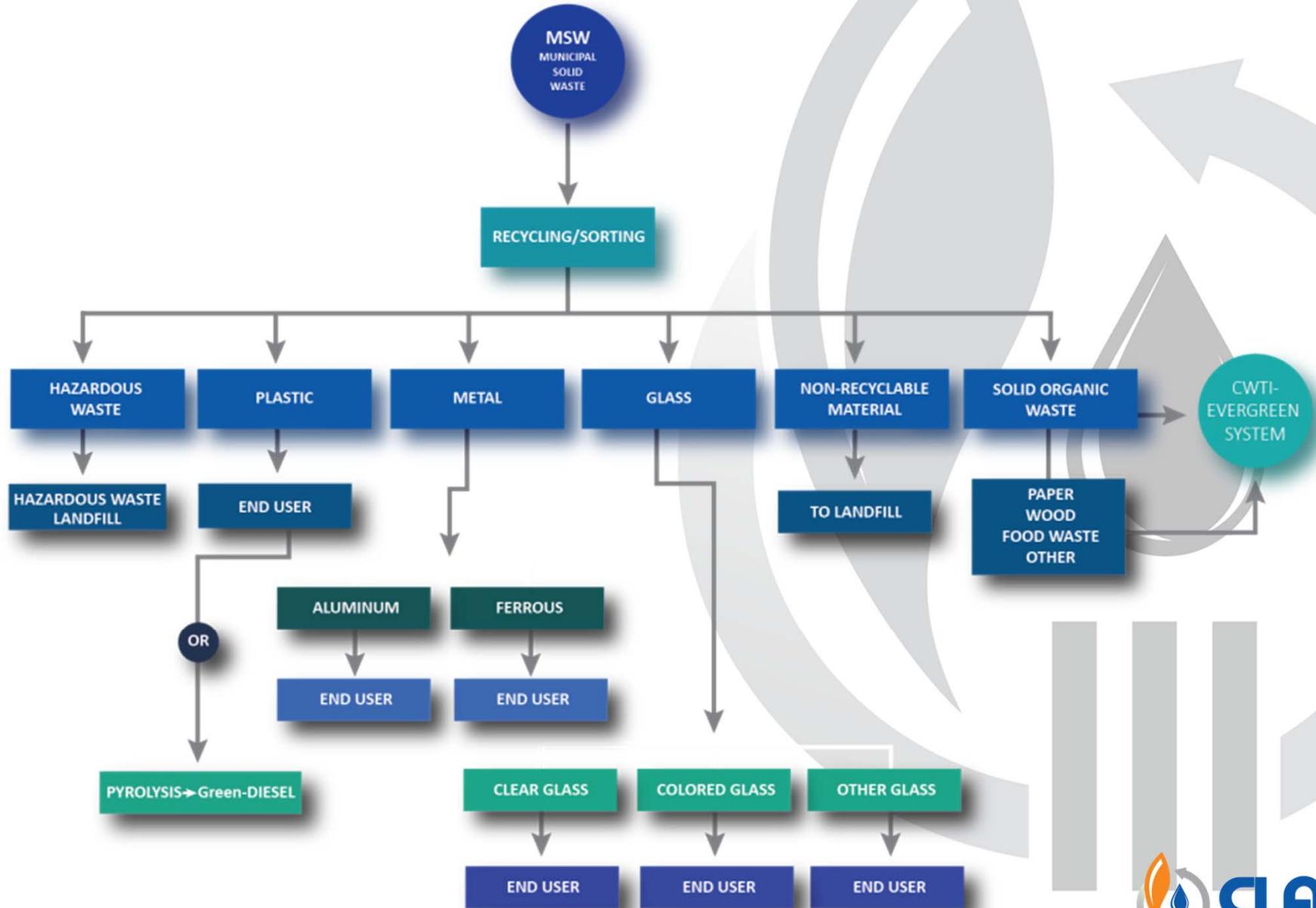
The Solution

Recycle. Convert. Renew. Thrive.

- Integrated waste management and waste-to-energy conversion system is the gift that keeps on giving. **Diesel fuel:**
 - Plastics and tires recovered from the MSW are converted into No. 2 diesel fuel
 - This fuel can be used to run most diesel engines



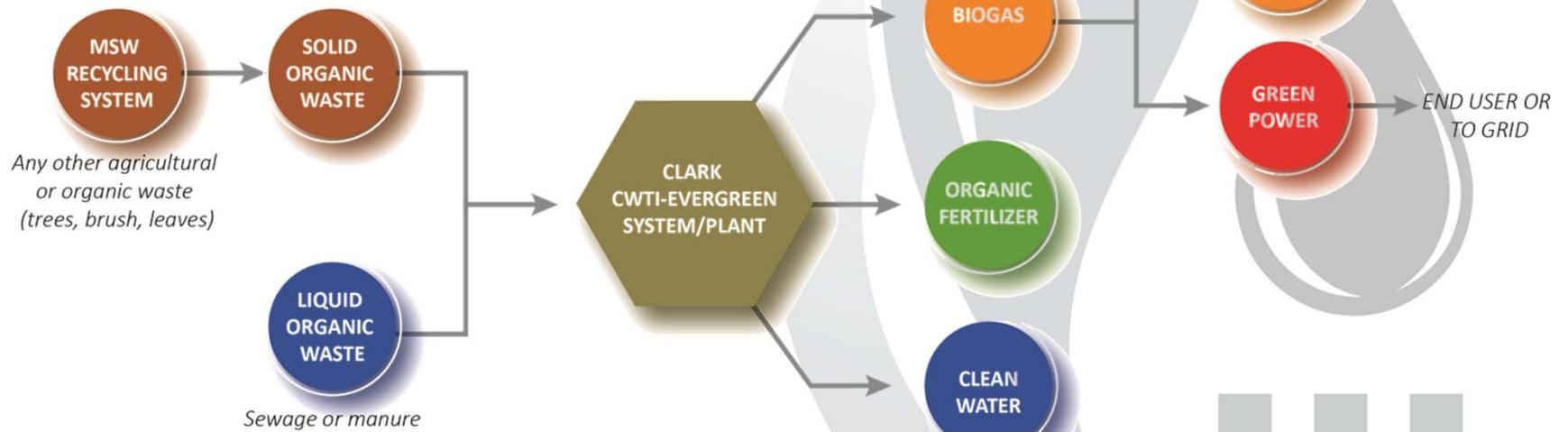
MSW Sorting Diagram



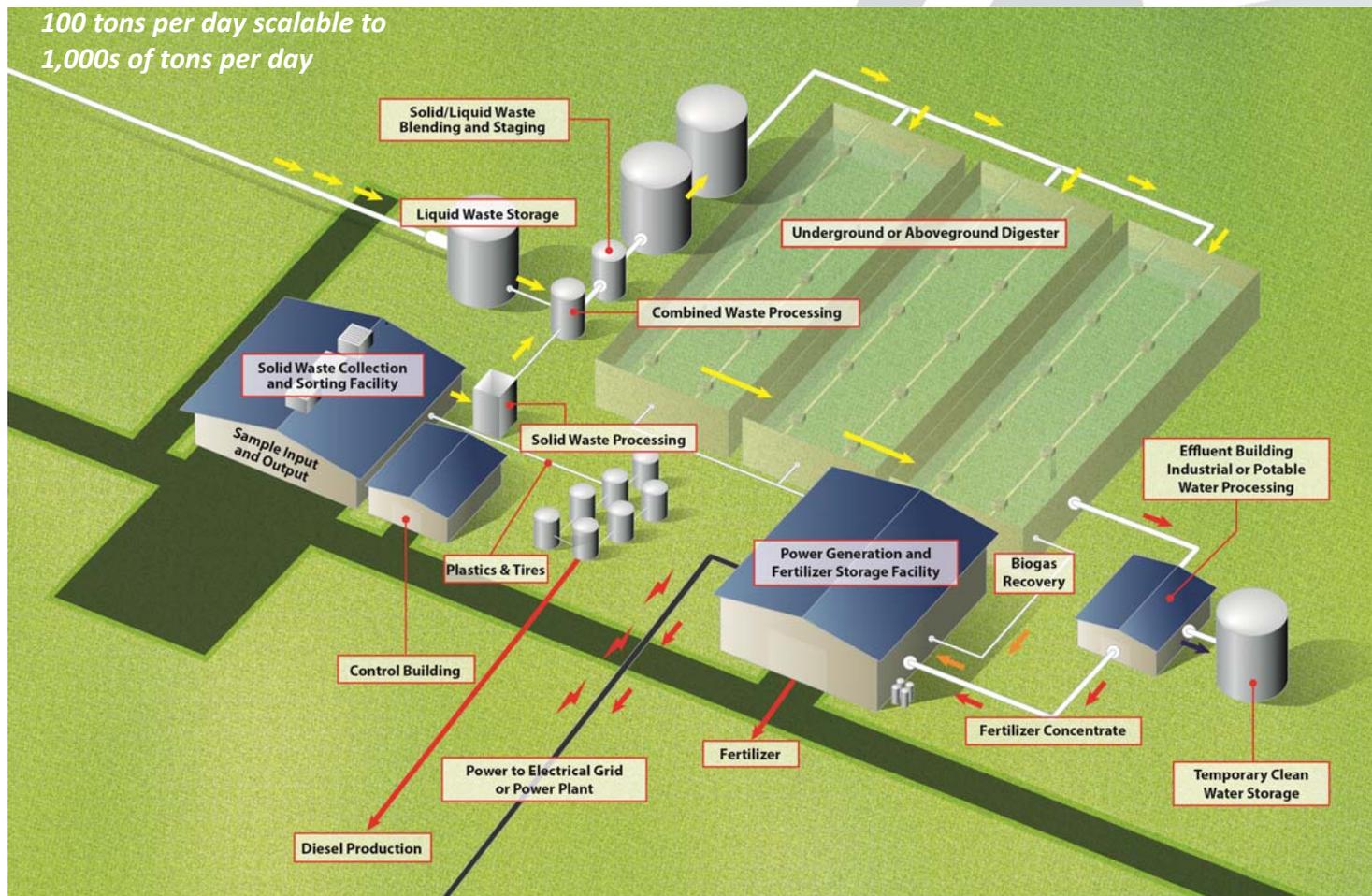
The Benefits

Sample MSW for Rochester, MN			
MSW Discards (After Curbside Recycling) by weight			
Food, Yard Wastes and Organics	32.20%	64,400	32.2 tons
Textiles, Rubber, Leather, Wood	21.30%	42,600	21.3 tons
Plastics	17.60%	35,200	17.6 tons
Paper and Cardboard	14.80%	29,600	14.8 tons
Metals	9.00%	18,000	9 tons
Glass	5.10%	10,200	5.1 tons
	100%	200,000	100 tons
Total Organic (Organic + Paper + Cardboard)	47.00%	94,000	47 tons
Plastics, Rubber, Oil (Pyrolysis)	38.90%	72,200	36.1 tons

Clark-Evergreen Patented Anaerobic Digestion and LEACHBUSTER[®] System



A Look Inside: Clark-Evergreen Patented AD Process and System



By converting much of that biogas into green electricity with a co-gen electric power facility, green power can be provided to many more thousands of homes and businesses than by utilizing other waste-to-electricity conversion methodologies.

The Process

- **The Clark-Evergreen process**
 - Recovers 80% or more of the NPK-rich bio-solids as organic fertilizer
 - Sequesters and removes macro and micro nutrients from the water column

Examples of Commercial AD Plants



The Benefits

- **Single process**
 - Significantly reduces the need for landfills and wastewater treatment facilities
 - Combines these facilities into one all-encompassing system

The Benefits

Scalable

- Lack of space to install and full-scale water or sewage treatment plant is no problem
- Each Clark-Evergreen system is custom-designed and can be scaled to meet the capacity needs of each user
- Capacity can be added as needed

The Benefits

Self-sustaining

- Energy produced by the system can provide gas or electricity to a business/community
- Excess energy may be sold back to the existing utilities that provide gas and electrical service to the community
- This completes the full circle of the sustainable treatment cycle

The Benefits

Cost effective

- The Clark-Evergreen system can process virtually any organic source material without costly treatment steps and chemicals
- Maintaining and powering the system is the only cost associated with it after installation
- These costs can be offset by a small portion of the energy produced and income from energy, water, and fertilizer



Next Steps

Questions?