



GREENWATER
ENVIRONMENTAL CLEAR CORP



**Puerto Rico Aqueduct
and Sewer Authority**
GOVERNMENT OF PUERTO RICO

CAROLINA WWTP WASTEWATER TREATMENT PLANT, PUERTO RICO

OPERATIONAL SLUDGE REDUCTION AND
ODOR MITIGATION PROGRAM

EXECUTIVE SUMMARY



Reduction of sludge in the system



Reduction of sludge hauling trucks



Reduction of foul odors



Stabilization of biological activity



Compliance with discharge parameters



Significant reduction in operating costs



**Proven in a municipal treatment plant
operating under EPA requirements.**



CURRENT CHALLENGES IN MUNICIPAL PLANTS



**Excessive
sludge
accumulation**



**Degradable odors
and generation
of H_2S**



**High costs
of transport
and disposal**



**Clogging in pumps
and pipes**



**Organic overloads
and septic
conditions**



**Aging infrastructure
and high
maintenance**



TECHNOLOGICAL APPROACH BIOLOGICAL OPTIMIZATION



**Controlled
bioaugmentation**



**Stimulation of
native biomass**



**Reduction of
septic
conditions**



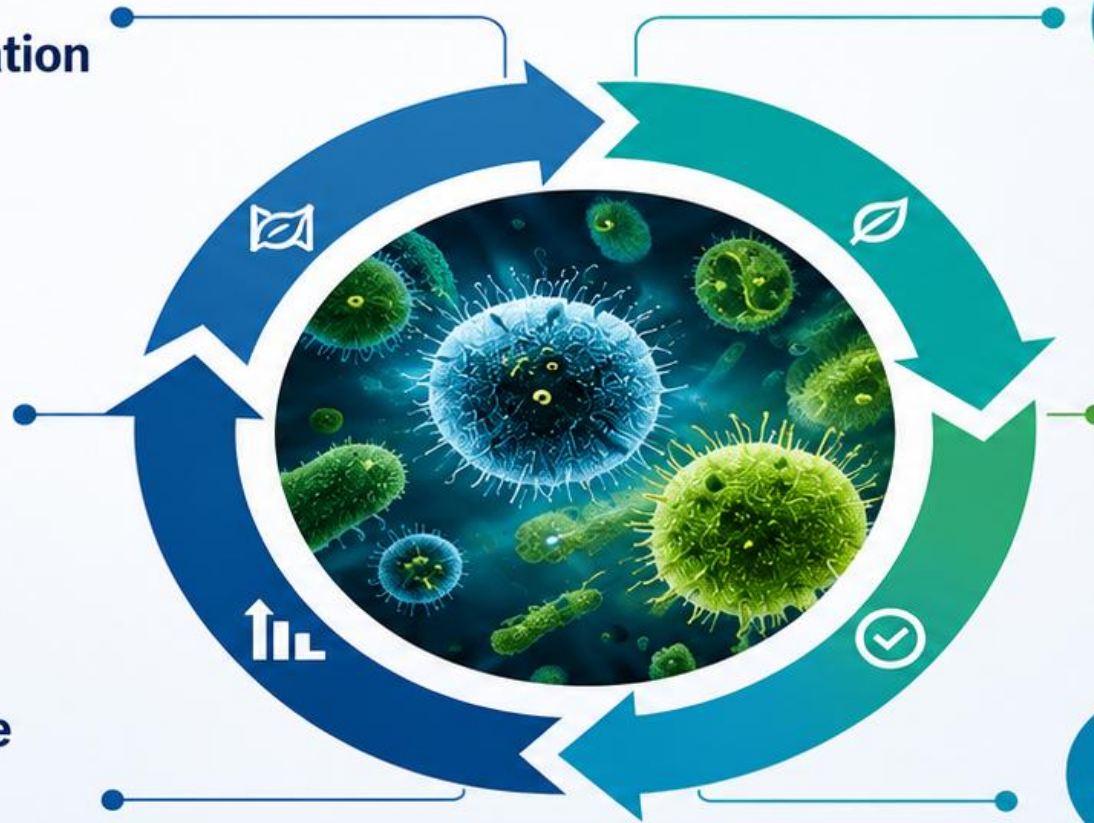
**Acceleration of
organic
digestion**



**Lower sludge
production**



**Odor reduction
and operating
cost savings**



CASE STUDY

CAROLINA REGIONAL WASTEWATER TREATMENT PLANT

PUERTO RICO



Municipal Plant



Capacity: 45 MGD



Operation: 2008 – 2009



OPERATIONAL RESULTS

Significant Improvements Achieved

OPERATING COSTS

(USD per month)

\$93,000

\$55,000

Before

After

41%
REDUCCION

SLUDGE TRANSPORTATION

(Trips per month)

47

24

Before

After

49%
REDUCCION

SLUDGE LEVEL IN STORAGE TANKS

16'-20"

Before

3'-10"

Before

After

80%
REDUCCION



Aqueduct and Sewer
Authority

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PERFORMANCE IN SLUDGE REDUCTION

Reduction in sludge transportation
(Boxes per month)



Reduction in sludge level
in storage tanks
(Feet / Inches)





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ENVIRONMENTAL COMPLIANCE

Support for Discharge Permits

DBO EFFLUENT

Permit Limit
<130 mg/L



61 mg/L
(Compliant)

FECAL COLIFORM

Permit Limit
 $\leq 2,000$ MPN/100 mL



<2 MPN/100 mL
(Compliant)

FLOW / DISCHARGE

EPA Discharge Permit
Achieved



 **EPA**
COMPLIANT



Operational stabilization has contributed to improved discharge parameters and compliance with the EPA discharge permit.





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ODOR MITIGATION

- ✓ Reduction of septic anaerobic conditions.
- ✓ Significant reduction of H_2S and irritating gases.
- ✓ Degradation of fats and organic matter.
- ✓ Stabilization of the biological process.
- ✓ Improved operating environment throughout the plant.



Fewer odors



Greater stability



Better environment



Fewer complaints

POTENTIAL APPLICATIONS FOR MIAMI-DADE WASD



**Pump Stations
(Lift Stations)**



**Force Mains
(Force Mains)**



**Primary
Clarifiers**



**Sludge
Holding Tanks**



Digesters



**Headworks
(Headworks)**



**Equalization
Tanks**



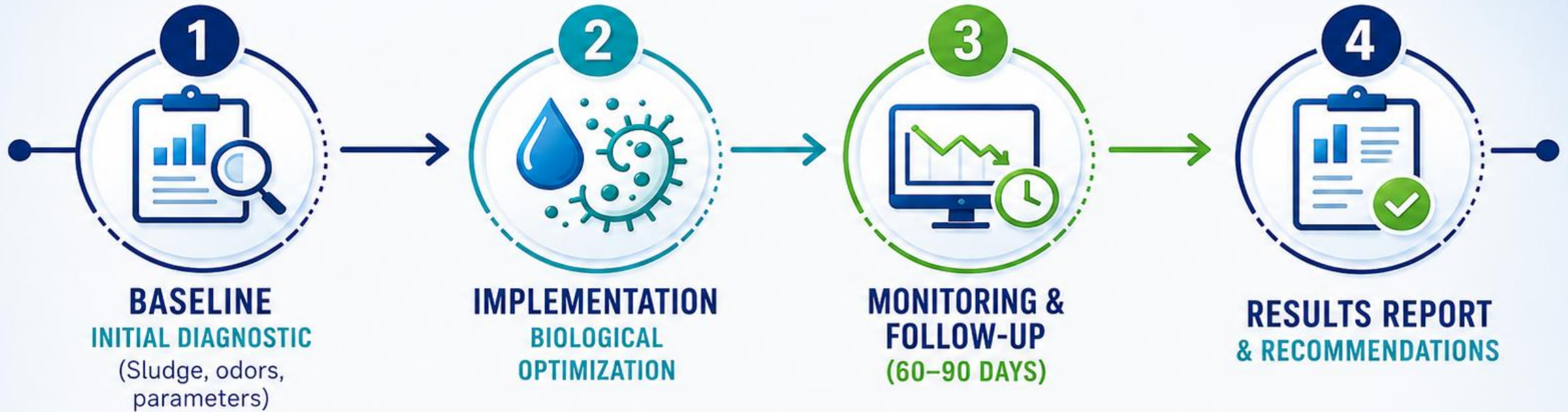
**Lagoons and Lakes
(Stabilization)**



**Odor Control
Programs**



RECOMMENDED PILOT PROGRAM



**SLUDGE
REDUCTION**



**ODOR
REDUCTION**



**FEWER SLUDGE
HAULING TRIPS**



**IMPACT ON
OPEX**



**PROCESS
STABILITY**



SUSTAINABLE BIOLOGICAL SOLUTIONS FOR WASTEWATER TREATMENT PLANTS



WE REDUCE SLUDGE.



WE MITIGATE ODORS.



WE OPTIMIZE OPERATIONS.



**SLUDGE
REDUCTION**



**ODOR
MITIGATION**



**LESS SLUDGE
HAULING**



**POSITIVE IMPACT
ON OPEX**



**PROCESS
STABILITY**