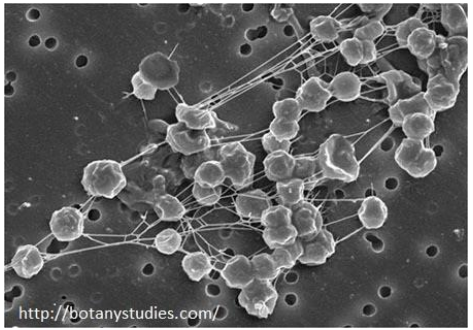
New Jersey
Wastewater Collection and Treatment Systems:
How Methane is Produced, Beneficially Reused and Controlled

New Jersey Clean Air Council
Annual Public Hearing
April 10, 2019



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Welcome to Wastewater 101 Collections Systems and Wastewater Treatment

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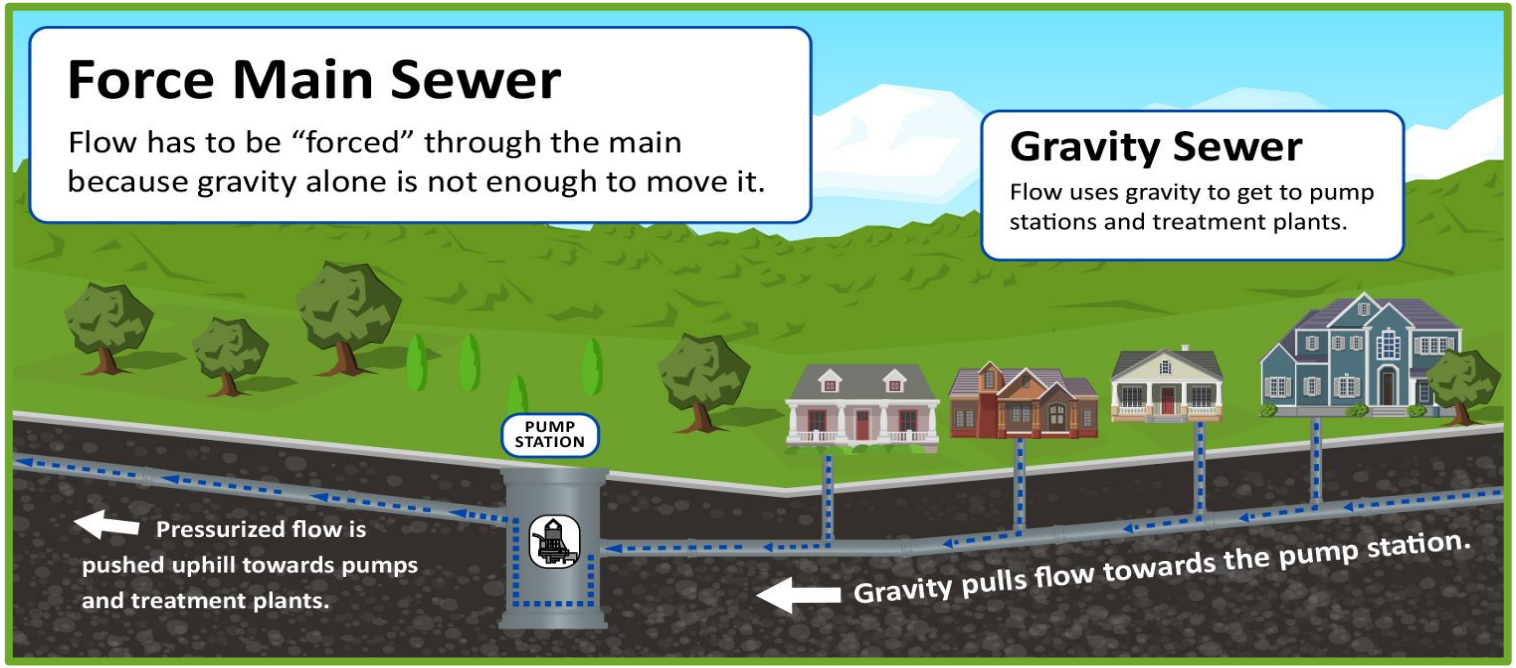
Wastewater Collection System



https://www.projectclearstl.org

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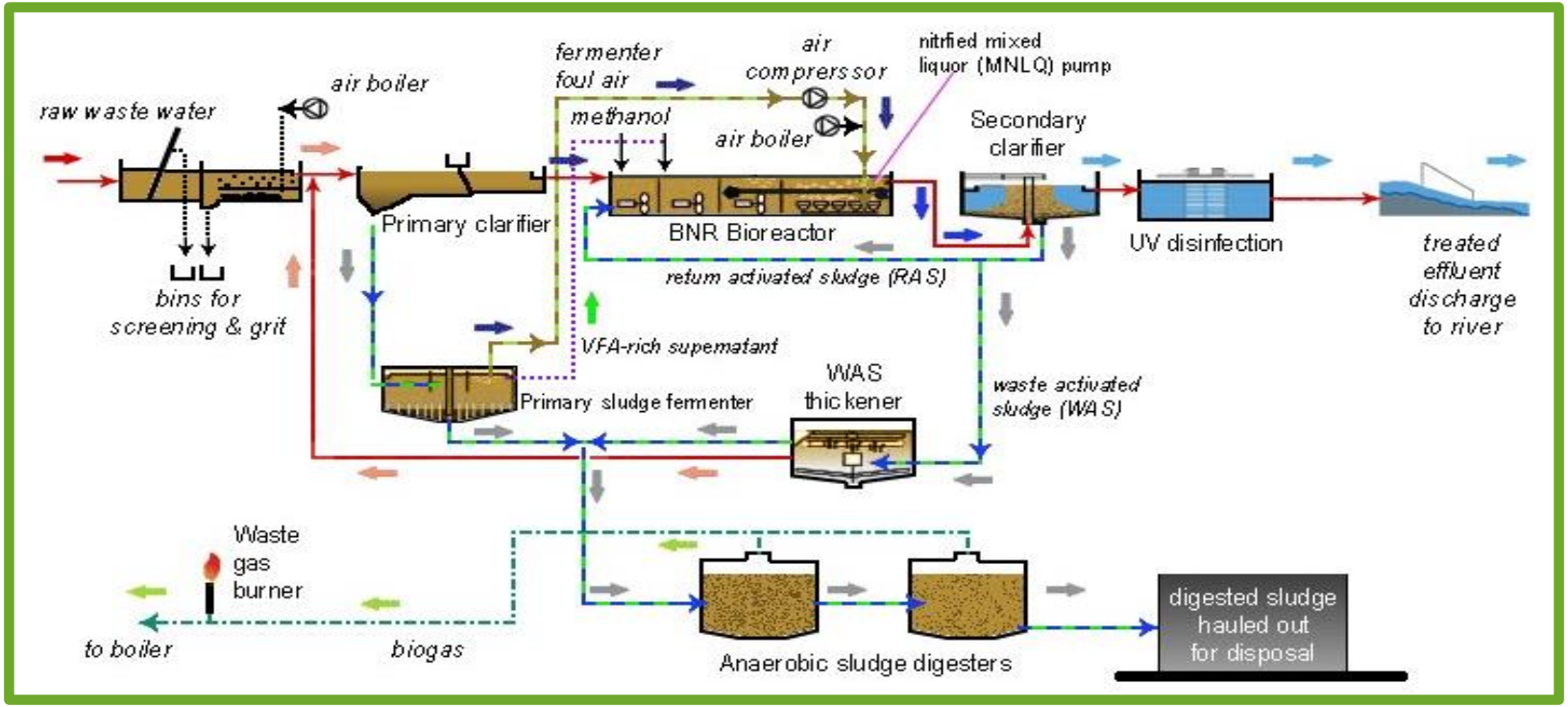
Wastewater Treatment Plant Flow Diagram



http://watertreatmentbyjani.blogspot.com/2016/05/process-of-wastewater-treatment-plant.html

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Activated Sludge / Aerated Lagoon

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Trickling Filter / Rotating Biological Contactor

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Methane Generation

Collection Systems &Treatment Facilities

Mitigation and Beneficial Reuse

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Methanogenesis is a natural anaerobic process. A great way to create methane gas as long as it is contained and used.

$$CO2 + 8\ H+ + 8\ e- \rightarrow CH4 + 2\ H2O$$

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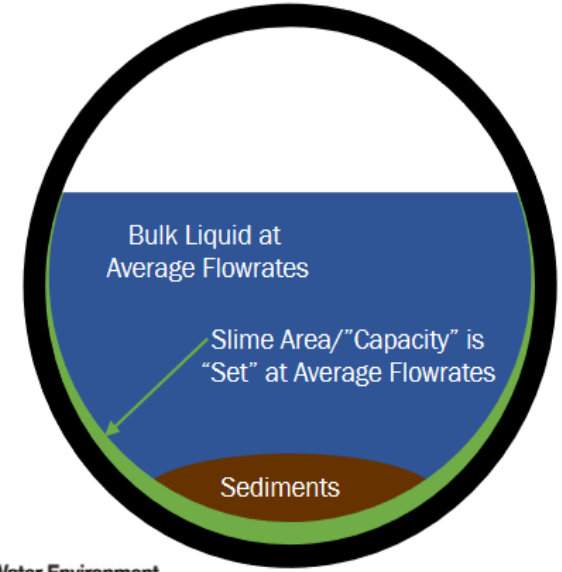
Sewer CH_4 Production



- Slime (biofilm) layers provide long residence time to support methanogens in deeper layers
- Sulfide reducers and hydrolyzers are more prominent in outer layers
- Some flow/velocity is needed to infuse carbon and sulfate into biofilm
- Sediments do not normally contribute to CH_4

Water Environment Federation
the water quality people

The Water Research Foundation

https://www.wef.org/globalassets/assets-wef/3---resources/online-education/webcasts/presentation-handouts/handouts-11-7-18.pdf

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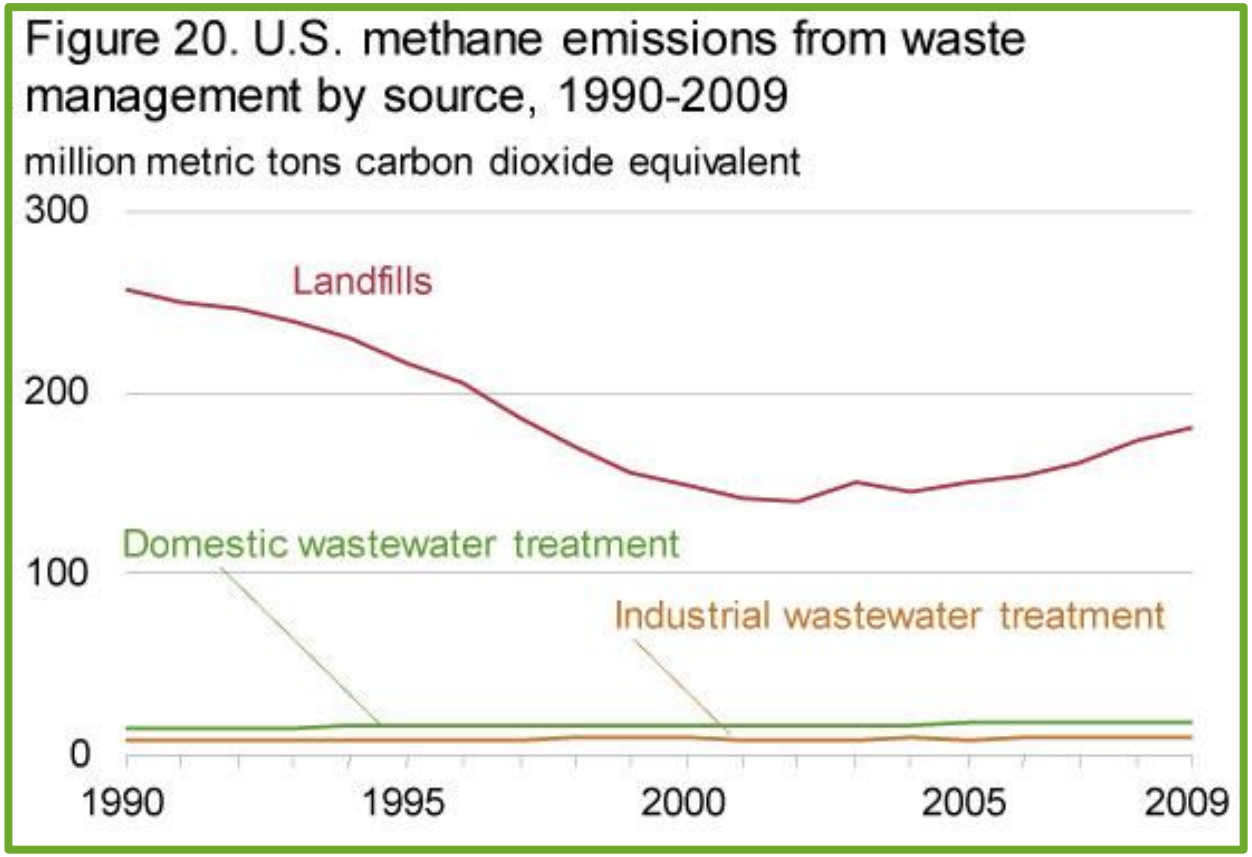
Conflict exists between GHG Protocols and Scientific Research on Sewer-CH_4

IPCC and other GHG protocols assume there is **No CH_4 from sewers** in the developed world

- **The USA's total GHG emissions are 7.0 B-MT CO_2e/yr**
- **All WW is 41 M-MT CO_2e/yr (0.59%)**
- **Centralized WW is 24 M-MT CO_2e/yr (0.34%)**
- **Sewer-CH_4 is 1 M-MT CO_2e/yr (0.015%)**

https://www.wef.org/globalassets/assets-wef/3---resources/online-education/webcasts/presentation-handouts/handouts-11-7-18.pdf



https://www.eia.gov/environment/emissions/ghg_report/ghg_methane.php

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Collection System Methane

(1) The Collection System is maintained by NJDEP C Licensed operators.
(2) Monthly collection system reports are submitted to POTWs and subject to NJDEP inspection.
(3) Sodium Hypochlorite, Bioxide and Potassium Permanganate are added to oxidize the wastewater.
(4) Activate carbon scrubbers and Biofilters are used for odors.
(5) Water jetting is used to clean the collection system pipes.

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Wastewater Treatment Facility Methane

(1) The Treatment Facility is maintained by NJDEP S Licensed operators.
(2) Many facilities have tank covers and use activated carbon scrubbers and biofilters.
(3) Biological wastewater treatment is mainly aerobic.
(4) Control of anaerobic digester gas is done via flares, engines or boilers and are regulated by NJDEP air permits.
(5) Sodium Hypochlorite is routinely used in the facility to oxidize the wastewater.

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Digester Gas Production Source

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Annual Digester Gas Production Potential

(1) 20 MGD Wastewater Facility can generate 150 MMCF of Digester Gas at ~ 60% Methane.

(2) Total Methane generation through anaerobic digestion is ~ 1557 Tons @STP.

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NJ Facility Survey

(1) Of 25 facilities, 18 have anerobic digestion producing gas, 4 incinerate biosolids, and 2 landfill biosolids.

(2) Of the 18 that produce gas, 10 used it for heat and power and 8 use it for just heat.

(3) Reasons to prevent all from generating power are related to inadequate consistent gas volumes, long term O & M cost, does not appear feasible for the facility.

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Digester Gas Combustion Sources

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2017 NJDEP Emission Statement Annual Report Methane Emissions

(1) Total for all reporting facilities ~ 44,299 TPY.

(2) Total for just wastewater facilities ~ 1,031TPY.

(3) Only ~ 2.3% of all reported Methane emissions were from wastewater facilities.

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Recommendations

(1) Create an outreach and education program to the wastewater industry on how they can do their part to lower GHG emissions.

(2) To aid with current and future Methane projects, continued funding is needed from the Environmental Infrastructure Financing Program, Clean Energy Program, and the Energy Resilience Bank.

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The Big Picture - Wastewater Industries Mission

The NJDEP and USEPA regulated wastewater industry plays a key role in protecting the public health and preserving the environment for current and future generations. This is accomplished in a cost-effective manner for utility rate payers by licensed and skilled professionals who ensure that safe and clean water is recycled back into the natural ecosystem.

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