



INFILTRATOR

water technologies



The *Blurred* Lines of Onsite and Centralized Wastewater Treatment

Jonathan Kaiser – NOWRA 2021 – 10/19/21

Disclaimer

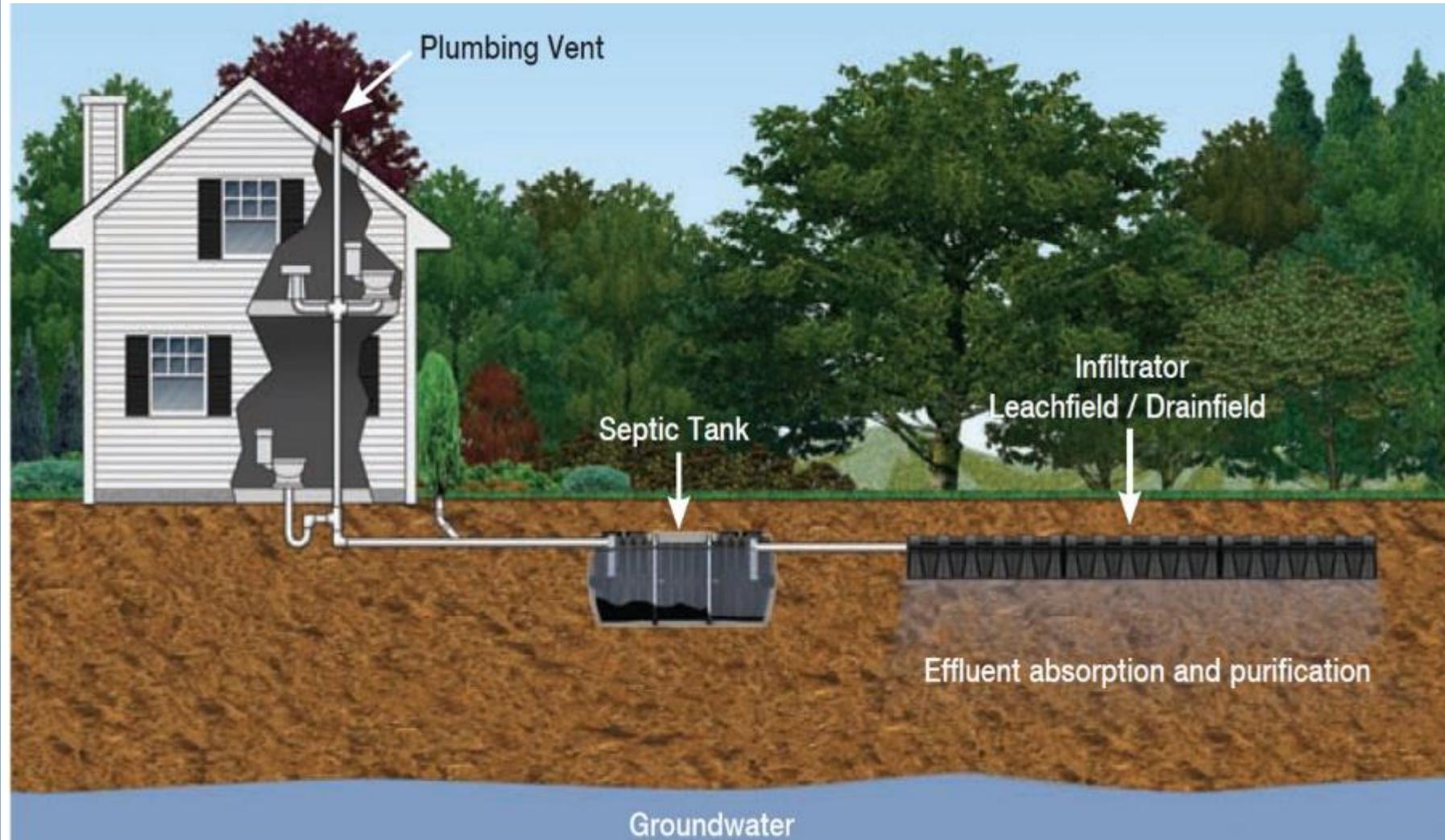
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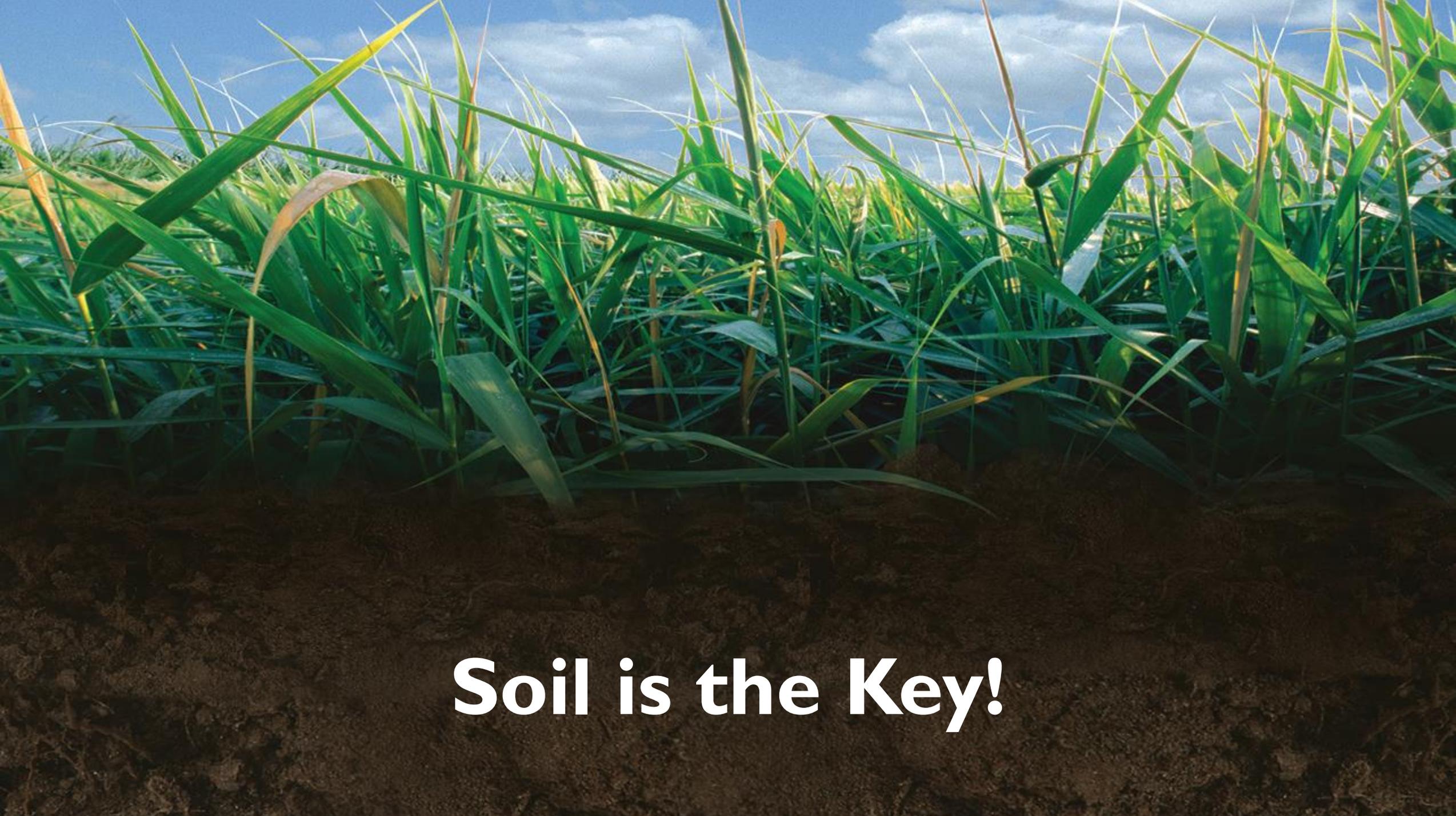
Presentation Topics

- Overview of Onsite and Centralized Wastewater Treatment
- Preliminary/Primary Treatment
- Secondary Treatment
- Tertiary Treatment
- Case Study
- Resource Consumption Study
- Considerations

Onsite Treatment

- Alternative to WWTPs
- Serves 25% of population
- Collects, treats, and disperses near point of origin





Soil is the Key!

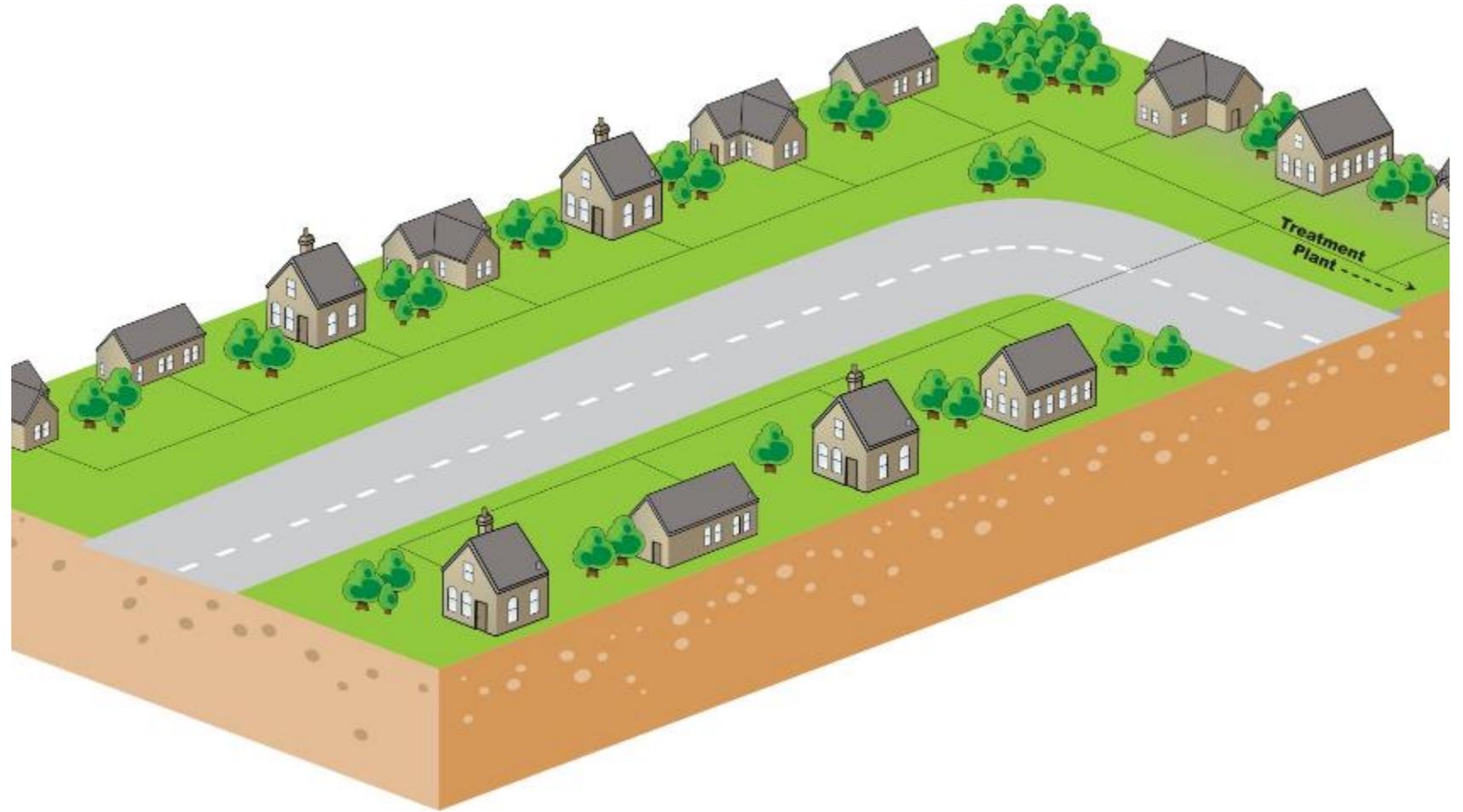
Other Benefits of Onsite Wastewater Treatment



- Reduced watershed impacts
- Aquifer recharge
- Water reuse
- Cost-effective
- Lower life-cycle cost
- Flexible in design
- Build on land not accessible to public sewer/infrastructure
- Phased building
- By definition: sustainable

Centralized Treatment

- Serves 75% of population
- Urban Cities
- Majority of funding



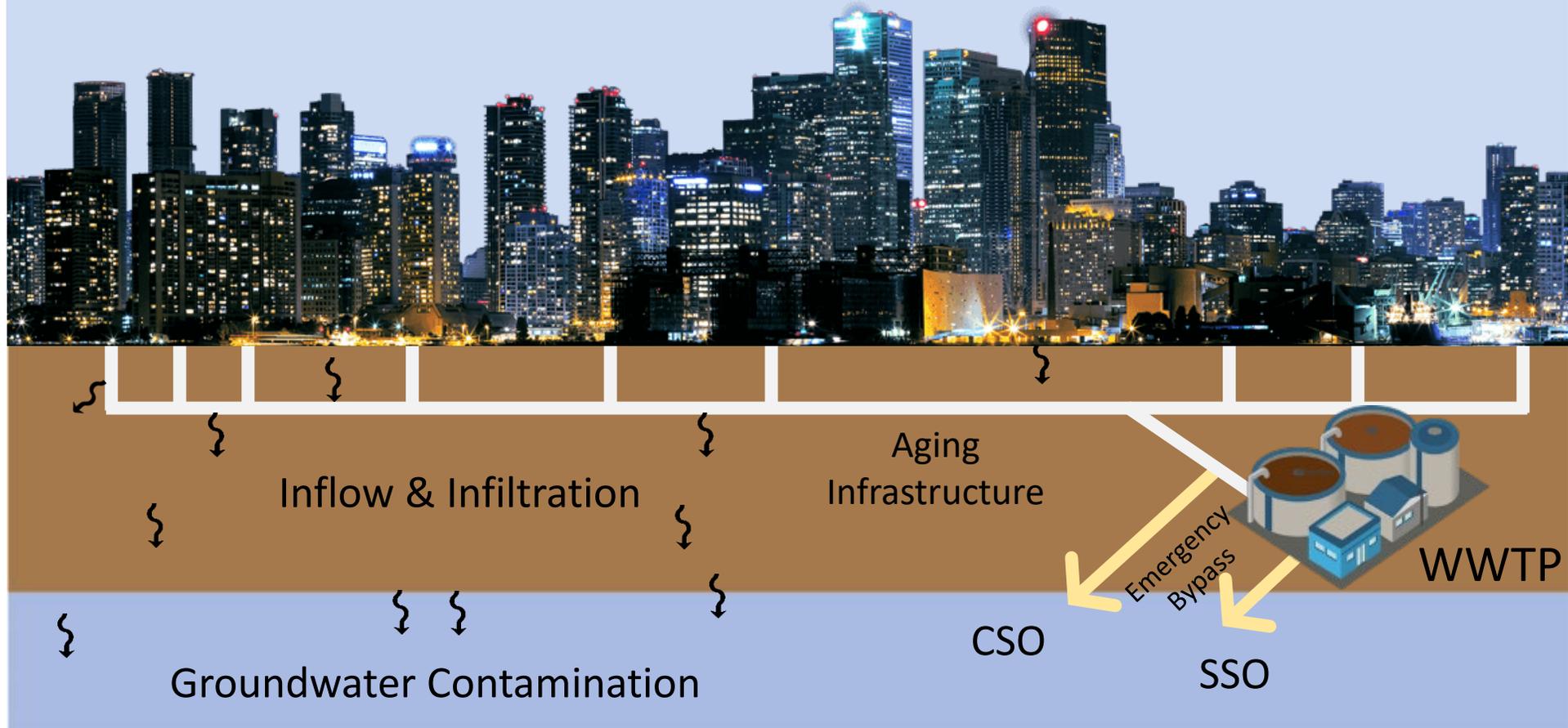
Centralized Approach

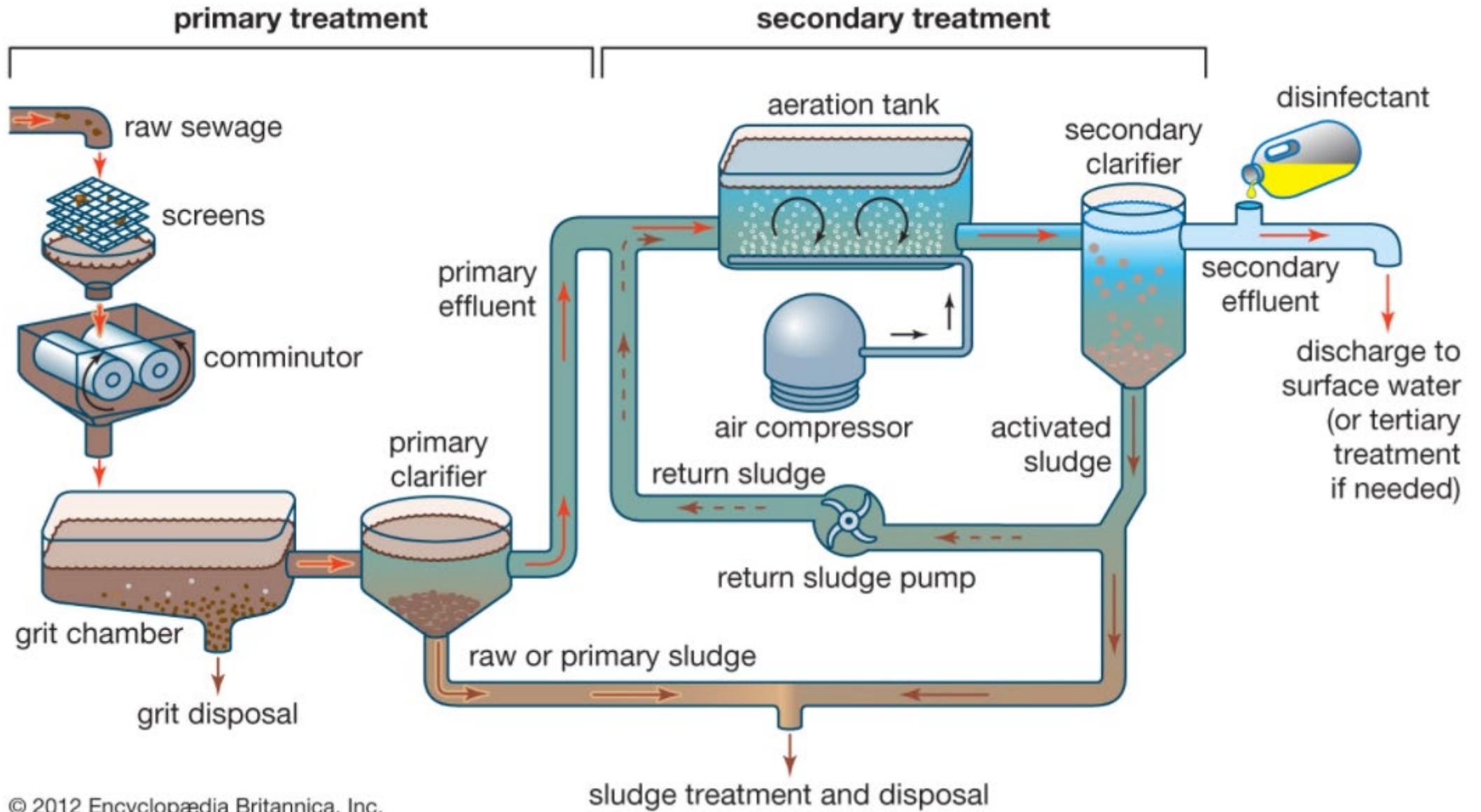
1. Draw clean water from watersheds
2. City consumption produces wastewater
3. Treated in Centralized WWTP
4. Surface water discharge



NYC DEP: *New York City's Wastewater Treatment System*

Centralized System – Overlooked Shortcomings (City Sewer Hookup)





Percent Removal of Wastewater Constituents

Constituent	Primary	Secondary	Tertiary
Suspended Solids	60-70	80-95	90-95
BOD	20-40	70-90	>95
Phosphorus	10-30	20-40	85-97
Nitrogen	10-20	20-40	20-40
E. Coli Bacteria	60-90	90-99	>99
Viruses	30-70	90-99	>99

Data from: <https://www.open.edu/openlearn/nature-environment/environmental-studies/understanding-water-quality/content-section-5.1>

Preliminary/Primary Treatment

Preliminary Treatment

- Removal of untreatable solids
- Screening
- Grit removal
- Does not include:
 - Organics removal
 - Suspended solids removal



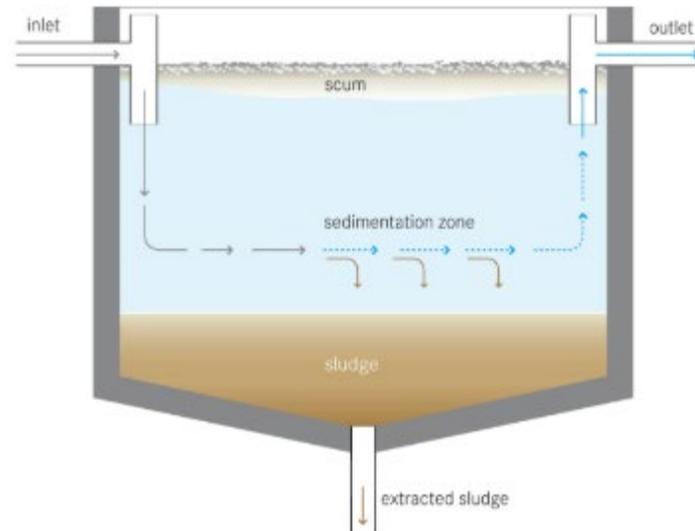
<https://www.directindustry.com/prod/sereco/product-91651-859733.html>



Preliminary/Primary Treatment

Primary Treatment

- Removal of organic matter
- Removal of suspended solids



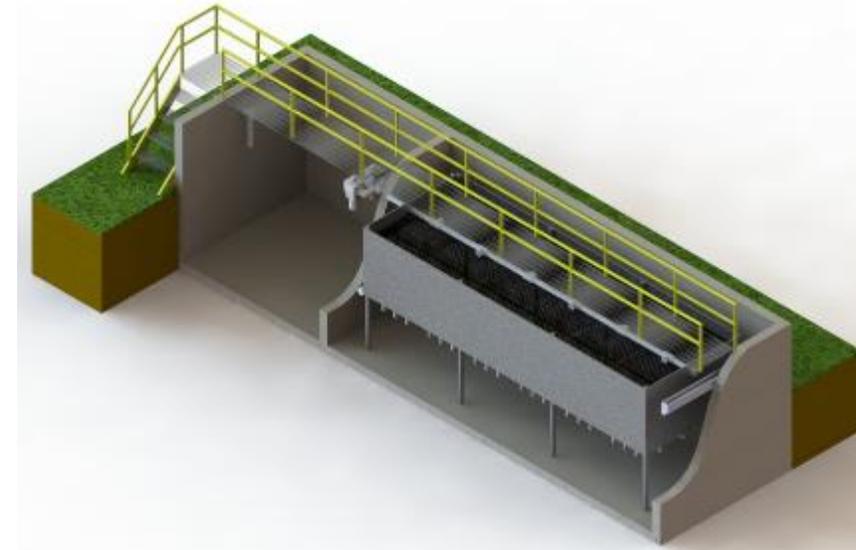
Secondary Treatment

Secondary Treatment

- Further removal of organic matter and solids
- Mostly physical and biological treatment



<https://sensorex.com/blog/2016/05/20/aeration-on-water-treatment/>



Septic Tank Effluent



**CTD
Treatment**

CTD Effluent



NSF/ANSI Standard 40

NSF 40 Testing Parameters

cBOD5

<25 mg/l

TSS

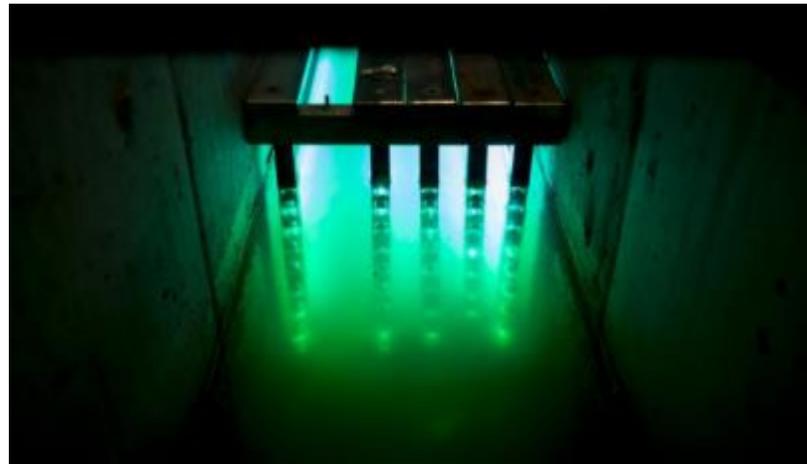
<30 mg/l



Tertiary Treatment

Tertiary Treatment

- Final cleaning process
- Treats remaining organics, solids, nutrients, bacteria, and viruses



<https://www.mlive.com/news/grand-rapids/2019/02/wyoming-considers-switch-to-uv-light-to-kill-wastewater-bacteria.html>



<http://www.salcor.world/3g-uv-unit.html>



IN Truck Stop CTD System

- Replacement of failing drainfield
- 8,600 linear feet of CTD distribution product
- Quick, sustainable, and cost-effective solution

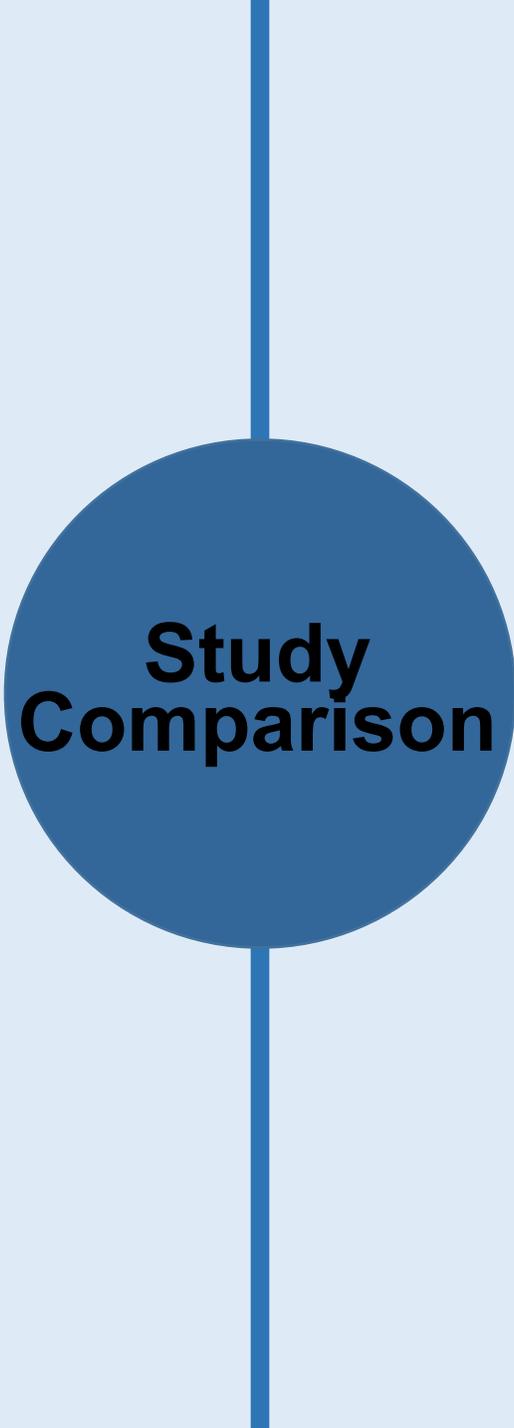
Resource Consumption Study



The total primary energy consumed [carbon released] over a life cycle,  including extraction, manufacturing, and transportation

Centralized

- Southwest Virginia Regional Wastewater Study (2005)
- 40 sewer extension projects

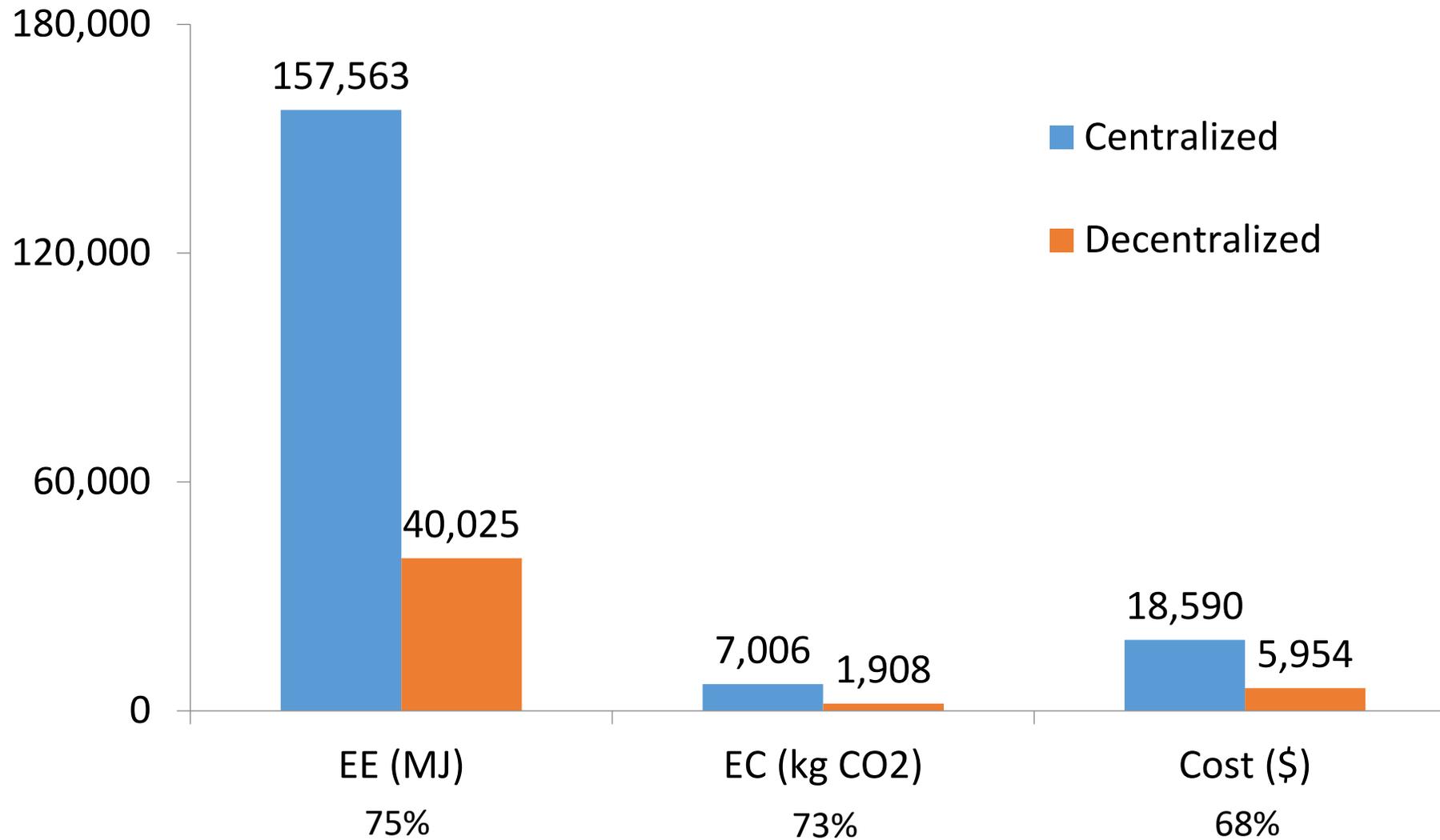


Study Comparison

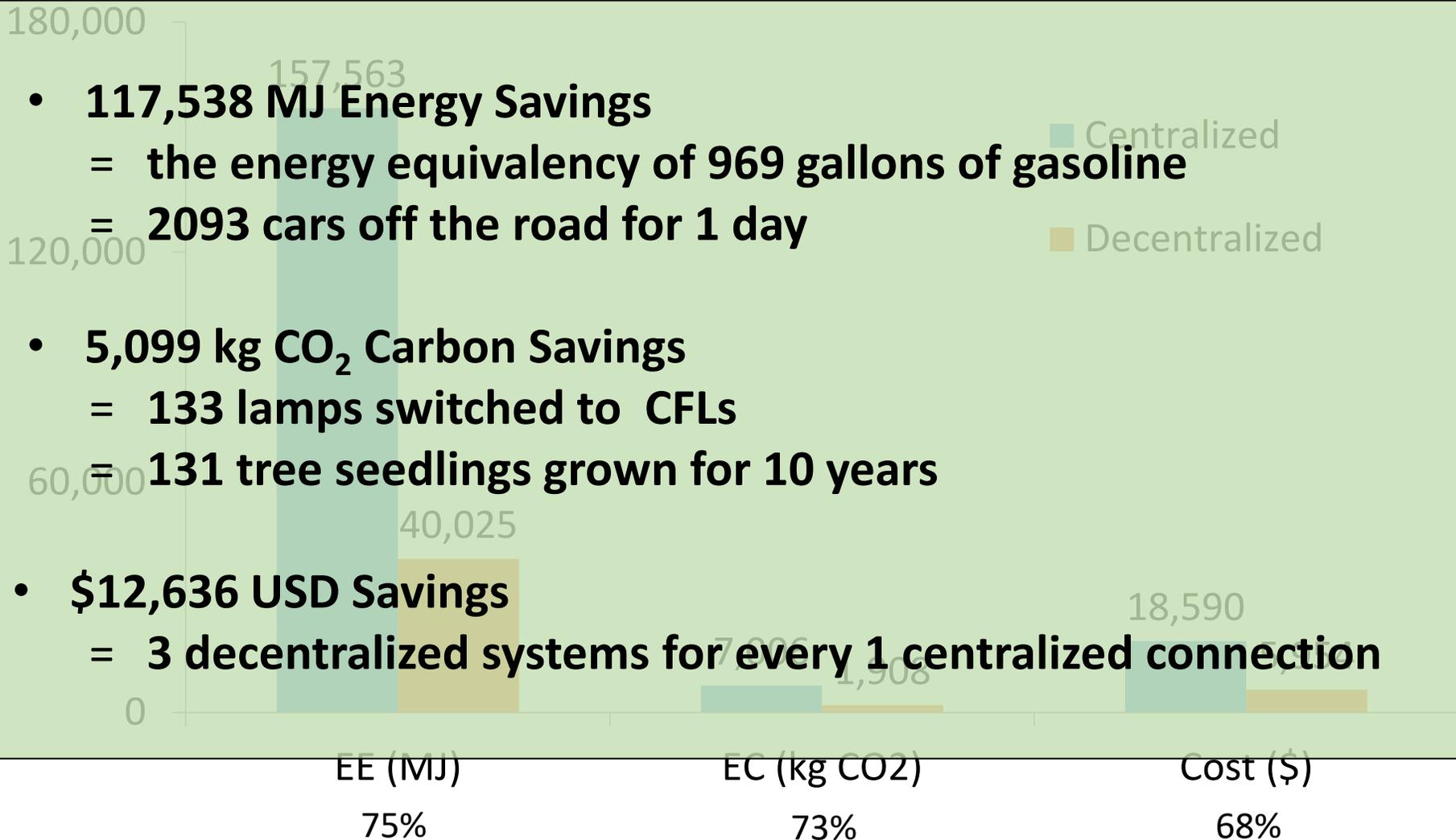
Onsite

- 3-bedroom home
- Precast septic tank and stone and pipe drainfield sized using 12VAC5-610

Average Per Connection Resource Consumption



Average Per Connection Resource Consumption



- **117,538 MJ Energy Savings**
= the energy equivalency of 969 gallons of gasoline
= 2093 cars off the road for 1 day
- **5,099 kg CO₂ Carbon Savings**
= 133 lamps switched to CFLs
= 131 tree seedlings grown for 10 years
- **\$12,636 USD Savings**
= 3 decentralized systems for every 1 centralized connection

Total Savings Using Onsite Systems

	Savings Per Onsite Connection	Average Number of Connections	Total Savings
Embodied Energy (MJ)	117,538	363	42,666,294
Embodied Carbon (kg CO ₂)	5,099	363	1,850,937
Cost (USD)	\$12,636	363	\$4,586,868

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	Savings Per Onsite Connection	Average Number of Connections	Total Savings
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Total Savings Using Onsite Systems

	Savings Per Onsite	Average Number of Connections	Total Savings
Embodied Energy (MJ)	42,666,294	363	42,666,294
Embodied Carbon (kg CO ₂)	1,850,937	363	1,850,937
Cost (USD)	\$12,636	363	\$4,586,868

- **42,666,294 MJ Energy Savings**
= **2100 people off the residential Virginia electric grid**
- **1,850,937 kg CO₂ Carbon Savings**
= **480 yearly round-trip commutes of 50 miles/day**
= **Carbon sequestered by 1,517 acres of U.S. forest per year**

Considerations

- Onsite is a viable alternative
- Centralized treatment technology can be scaled for onsite
- Effluent quality requirements
- Resource consumption
- Homeowner awareness

Questions?



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