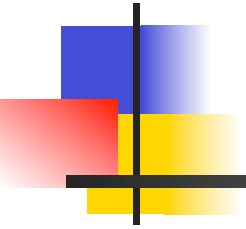


# ON-SITE SEWAGE DISPOSAL SYSTEMS



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# Regulatory Jurisdiction of Sewage Disposal Systems

- Who Regulates in CT?



**CT Department  
of Energy &  
Environmental  
Protection**



**Local and State  
Department of  
Public Health**



# Local and State Health Departments

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- Conventional Septic Systems with Design Flows of 5,000 Gallons Per Day (GPD) and Less



# Department of Energy and Environmental Protection

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- Design Flows Exceeding 5,000 GPD, and Alternative & Community Systems

# CONNECTICUT PUBLIC HEALTH CODE

## On-site Sewage Disposal Regulations, and Technical Standards for Subsurface Sewage Disposal Systems

**PHC Section 19-13-B100a** (e.g., Building Conversions, Changes in Use, Building Additions)

Effective August 3, 1998

**PHC Section 19-13-B103** (Design Flows 5,000 Gallons per Day or Less)

Effective August 16, 1982

### **Technical Standards for Subsurface Sewage Disposal Systems**

Effective August 16, 1982

Former revisions: 1986, 1989, 1992, 1994, 1997, 2000, 2004, 2007, 2009, 2011

Revised January 1, 2015

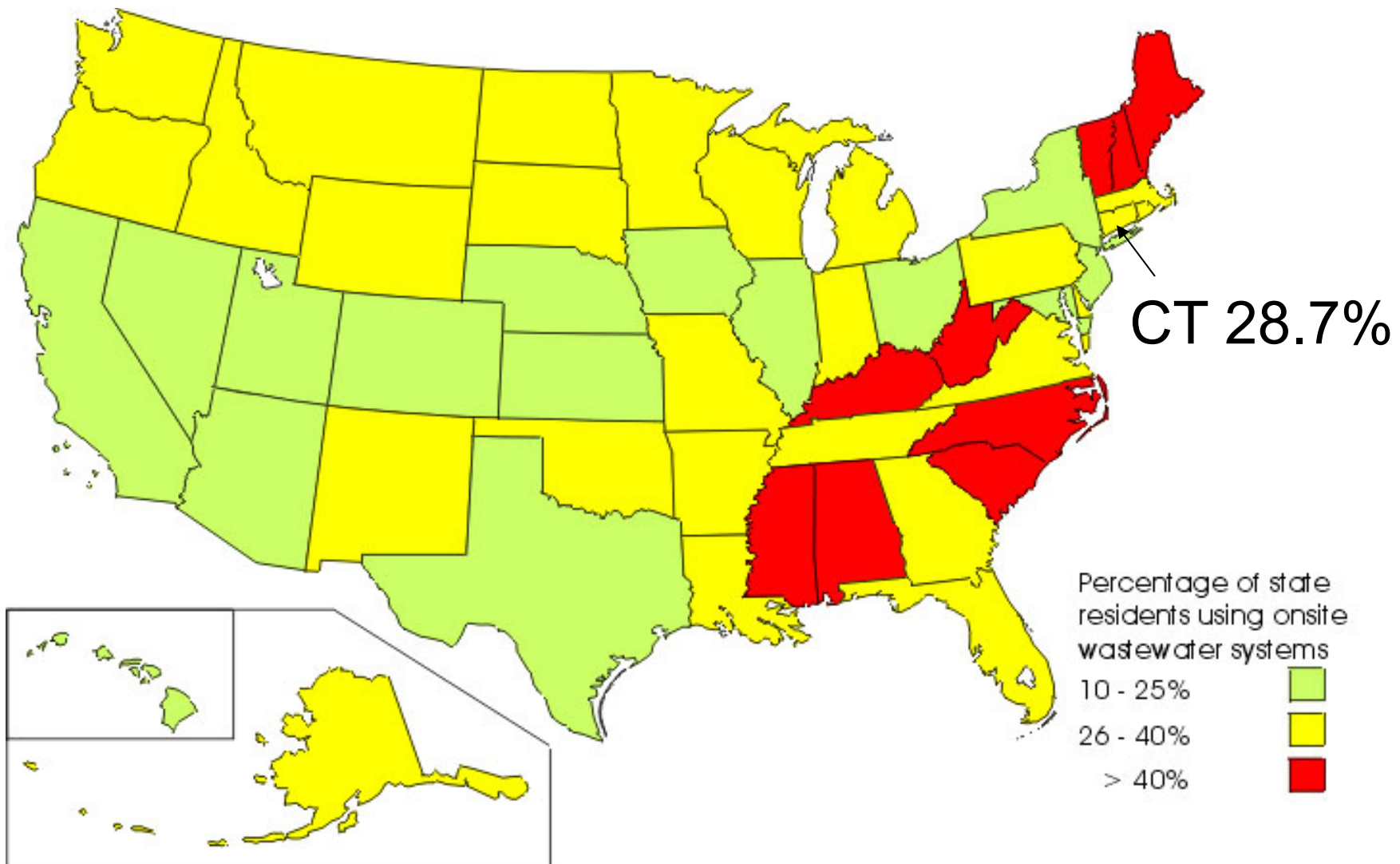
**PHC Section 19-13-B104** (Design Flows Greater than 5,000 Gallons per Day)

Effective August 16, 1982

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[www.ct.gov/dph/subsurfacesewage](http://www.ct.gov/dph/subsurfacesewage)

January 2015



Source: U.S. Census Bureau. 1990



# Why A Septic System?

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- Septics vs Sewers
  - Low density – towns wish to remain rural
  - Sewers too costly in rural areas
  - The goal - avoid groundwater pollution
  - Typically cause less pollution
  - Cost effective with proper maintenance

# Domestic Sewage





# Domestic Sewage

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- Water and human excretions
  - Toilets
  - Bathing water
  - Cooking and cleaning
  - Laundry
- Toilet wastes, laundry wastes, kitchen wastes, shower/tub water
- Waste from restaurants and commercial buildings



# Pollutants in Domestic Sewage

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- Coliform Bacteria
- Suspended Solids
- Bio-chemical Oxygen Demand (BOD<sub>5</sub>)
- Total Nitrogen
- Total Phosphates
- Grease and Oils

# Coliform Bacteria

- indigenous to the tract of humans and warm-blooded animals



- may not be harmful themselves, but indicates that pathogenic organisms and / or viruses may be present



- viruses are smaller than bacteria and not as easily filtered out



# Bio-Chemical Oxygen Demand

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- BOD
- measure of the amount of bio-degradable organic chemicals in the wastes
- High BOD = strong waste
- Low BOD = weak waste



# Bio-Chemical Oxygen Demand

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- Properly functioning septic tank will reduce the BOD in the effluent by about 25 to 30 percent (more with a two compartment tank)
- Further reduction occurs when the effluent comes in contact with bacterial growth in the leaching system (biomat)
- Amount of reduction depends on the volume of bacterial growth in the leaching system



# Nitrogen

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- Hazardous to infant children (methomoglobinemia or “blue baby disease”)
- Septic systems remove approximately 30% of total nitrogen with the remaining 70% being discharged to the groundwater.
- Separation distances to wells must be maintained



# Phosphate

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- Stimulates plant growth (lush green grass or algae growth in surface water)
- Readily removed by filtration through only a foot or two of most soil types



# Chemical Pollutants in Sewage

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- Paints, solvents, refinishing agents, cleaning chemicals, chlorinated hydrocarbons, etc.
- Considered to be hazardous chemicals since they can readily pass thru a septic system and enter the groundwater
- Amount of these chemicals in domestic sewage should be extremely small





# Non-Typical Domestic Sewage

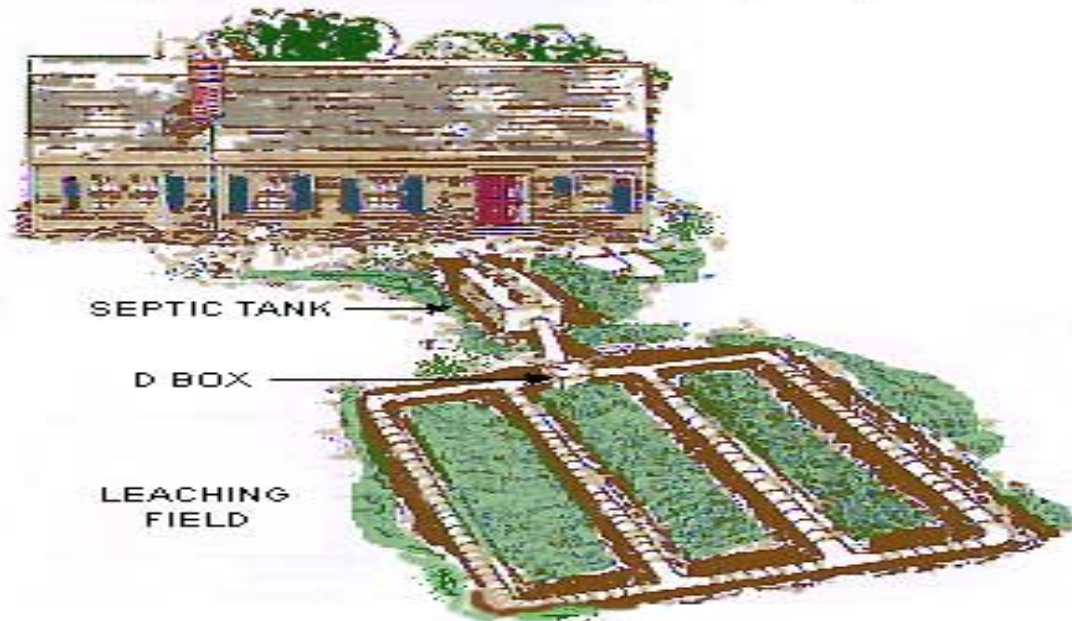
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- Kitchen wastes – extremely high in grease
- Wastes from garbage disposal systems contain large amounts of settleable solids and therefore the septic tank should be pumped more frequently
- Laundry wastes high in phosphates, clothing fibers, oils and bacteria shed from the body.

# Conventional “Septic Systems”

- **Serve approximately 1 million people in CT**
- **Defined as Subsurface Sewage Disposal Systems in CT regulations**

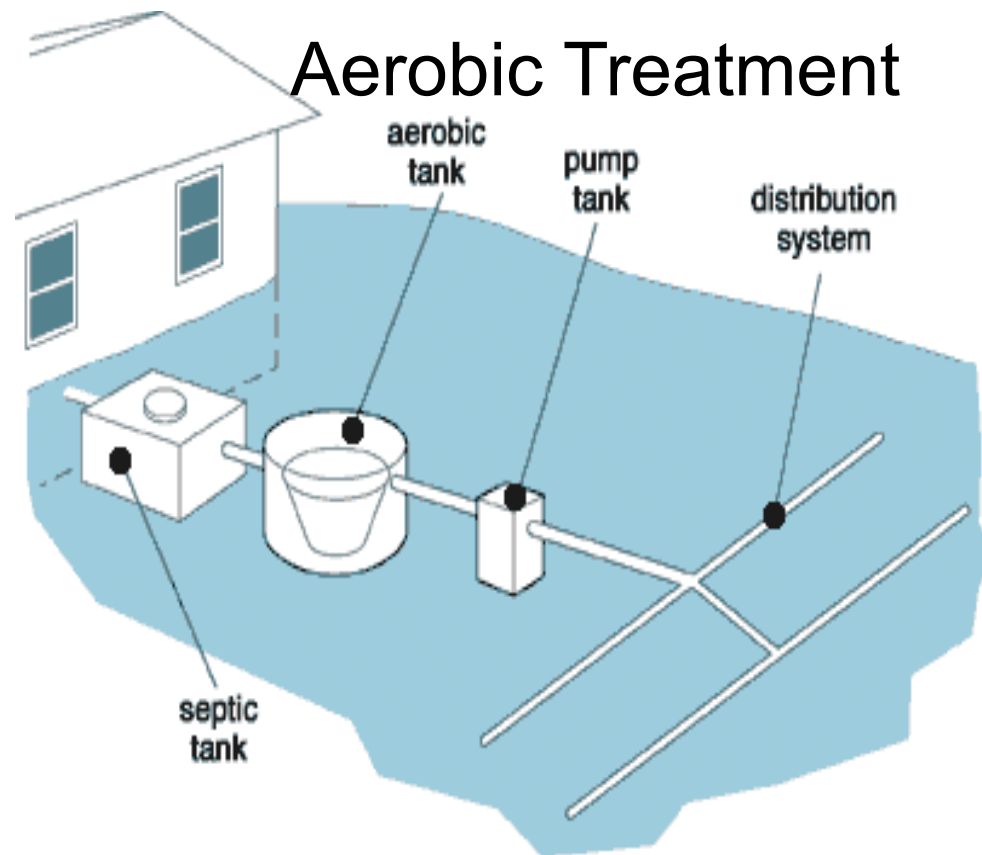
Drawing of a typical subsurface sewage disposal system





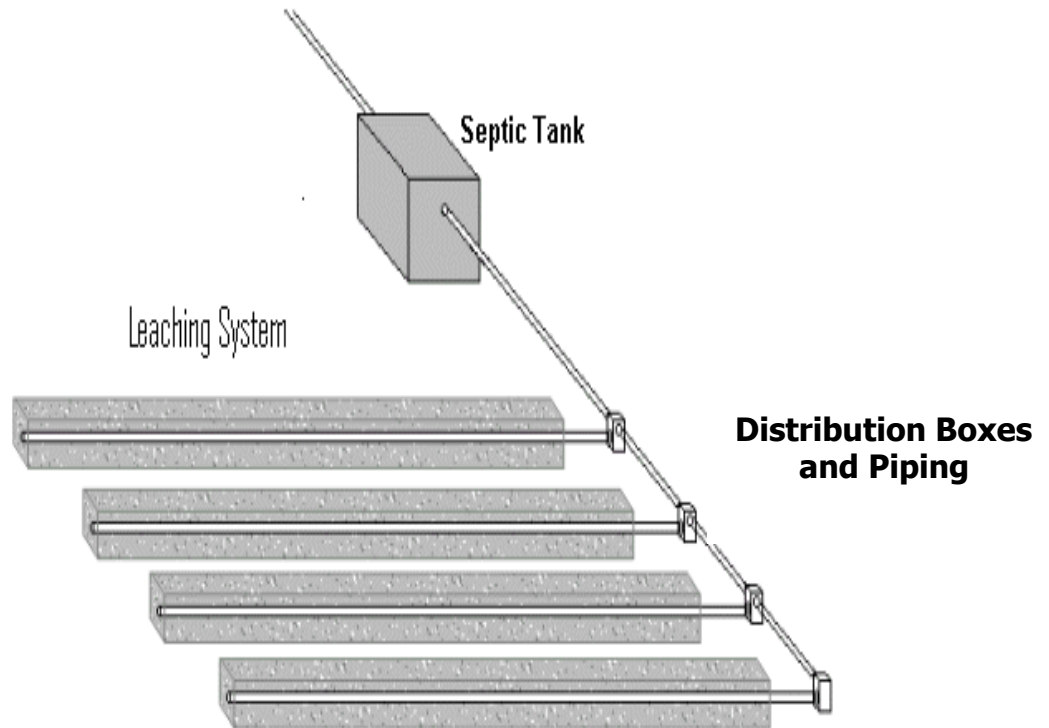
# Alternative Treatment Systems

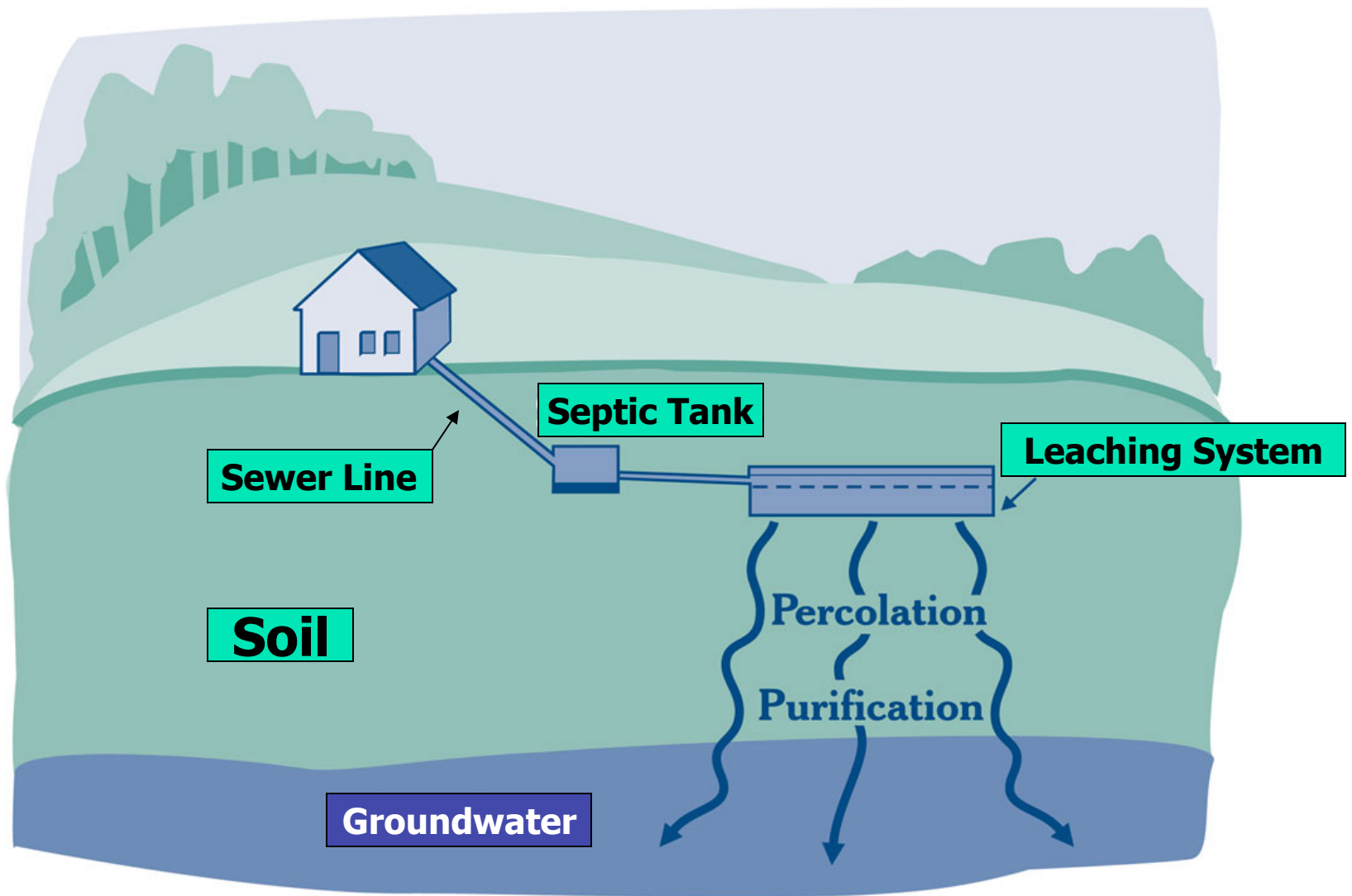
- **Wastewater Management District Legislation may allow for broader use**
  - **Requires DEP permit**
- Intermittent Sand Filter**

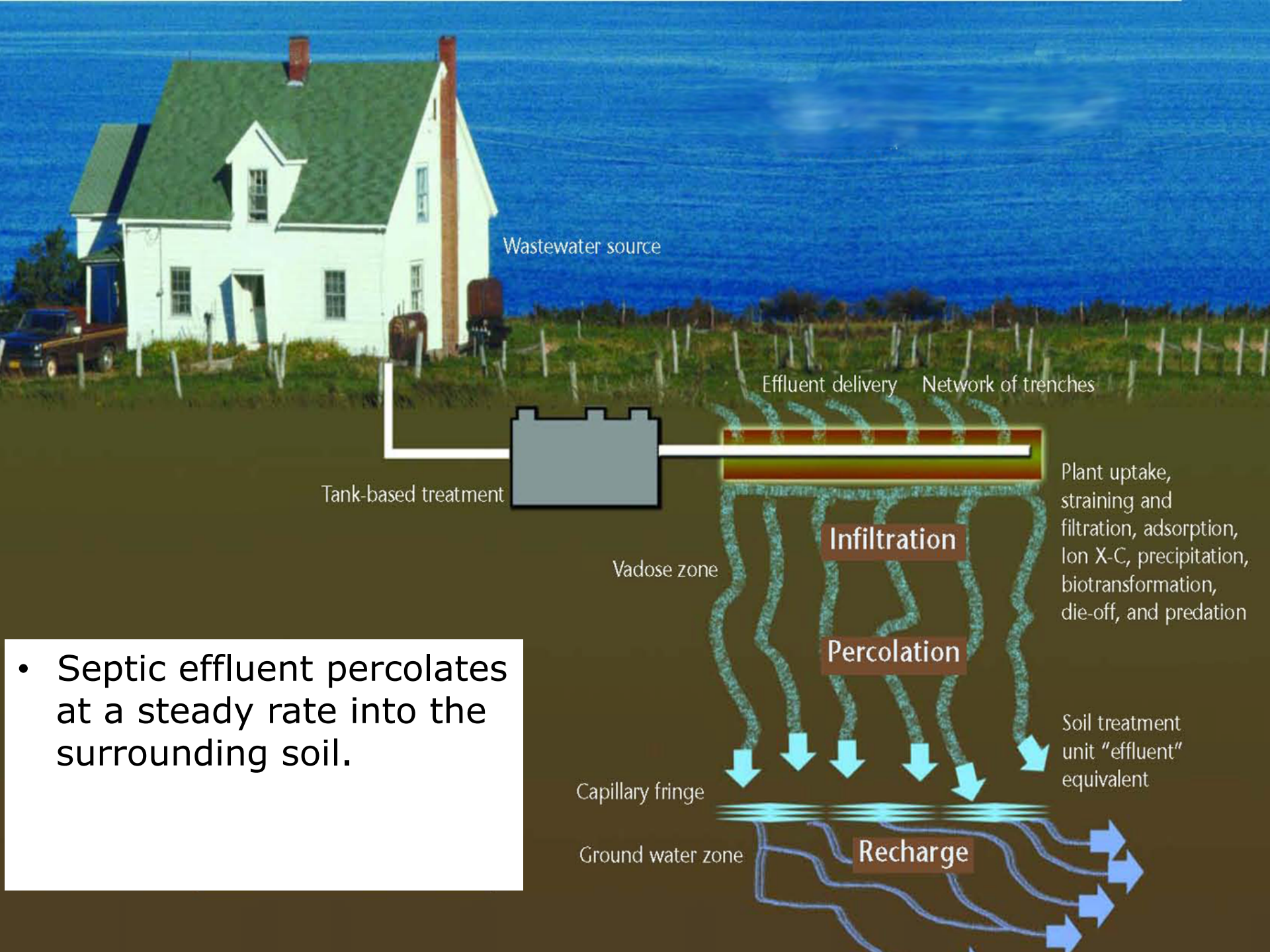


# What is a Septic System?

- Building Sewer
- Septic Tank
- Distribution Piping
- Leaching System
- Necessary pumps, grease traps and groundwater control systems



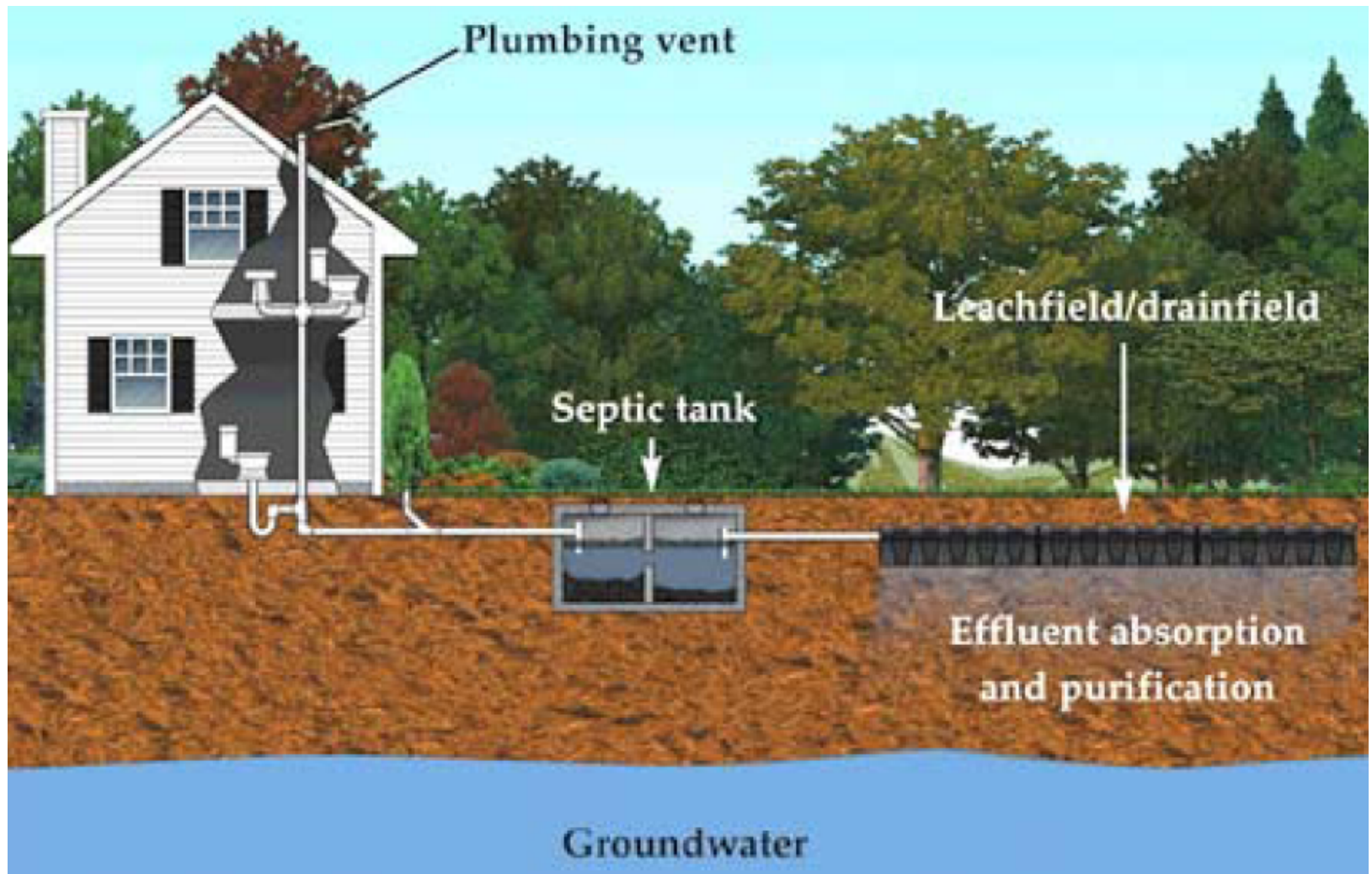




- Septic effluent percolates at a steady rate into the surrounding soil.



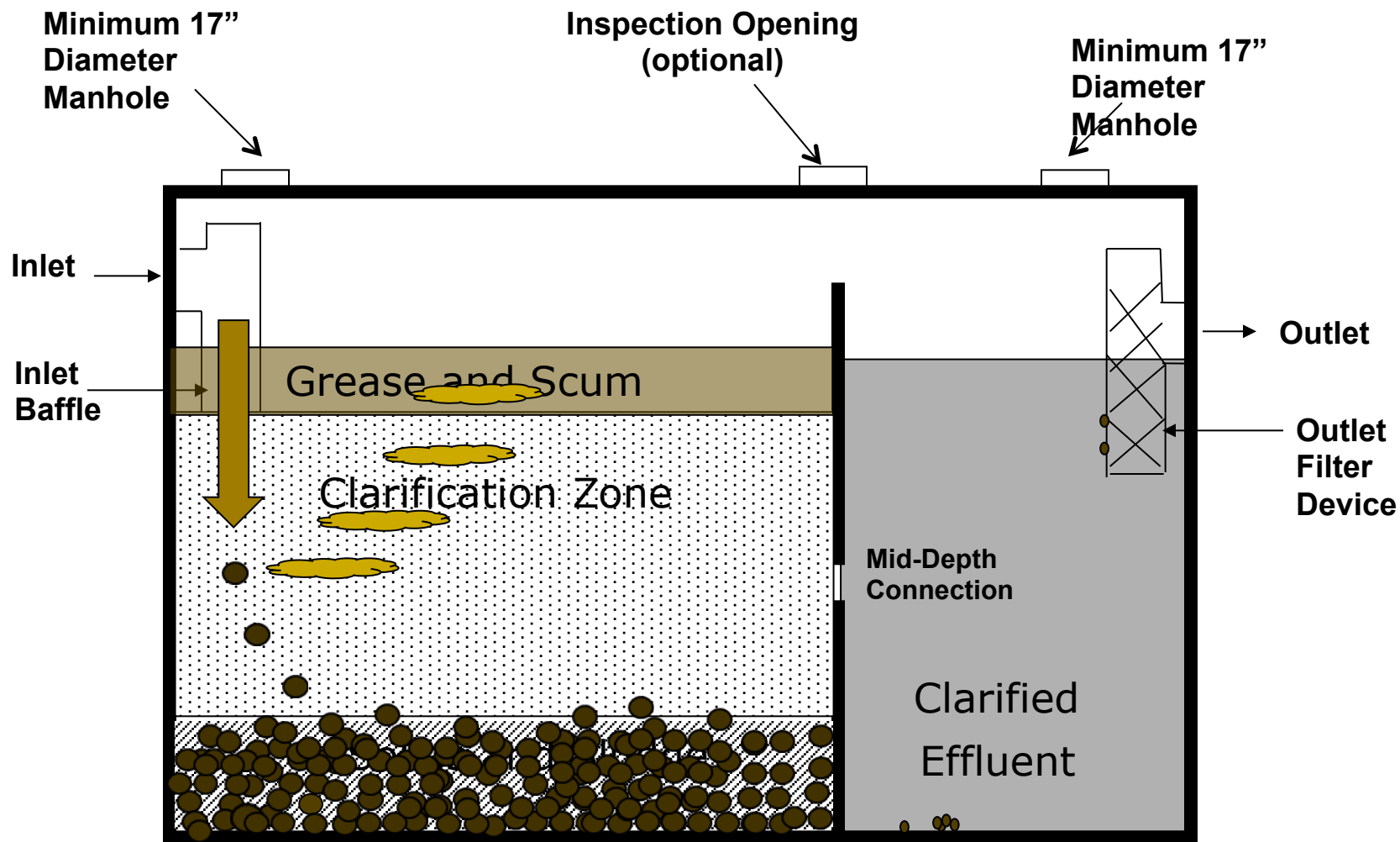




# Septic Tank

- Provides the primary treatment: separates, settles and digests





**Typical Septic Tank**

# Concrete Septic Tank



# Plastic Septic Tank

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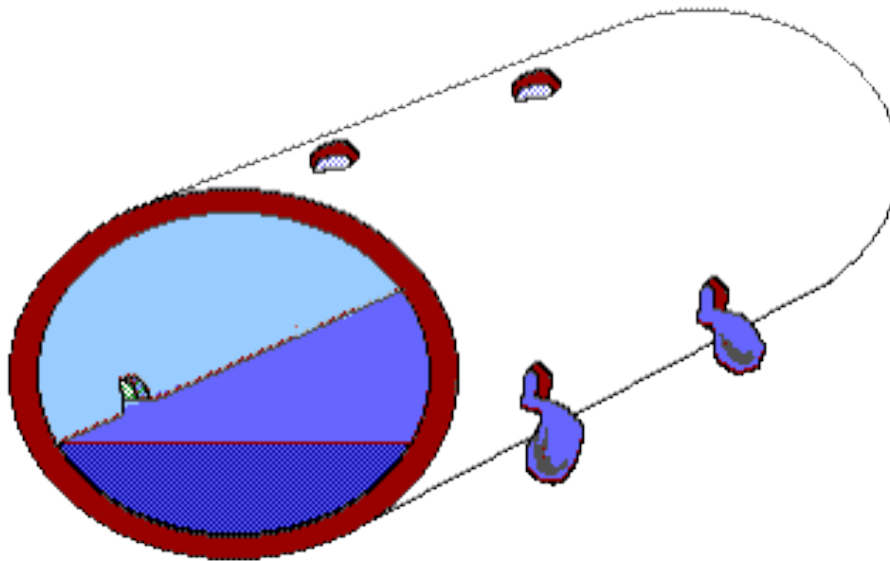
# Septic Tank with Effluent Filter



# Perforated Piping



# Perforated Piping



**4" Diameter  
Distribution  
Piping**

# Distribution Box



# Distribution Box Installed





# Leaching System

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- Properly functioning leaching system should treat and disperse effluent (liquid from the septic tank) into the surrounding soils without breaking out on the ground surface or polluting the groundwater.



# Leaching Types

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- Trench
- Pits
- Galleries
- Proprietary products
  - Plastic chamber
  - Mats
  - Forms
  - Cardboard



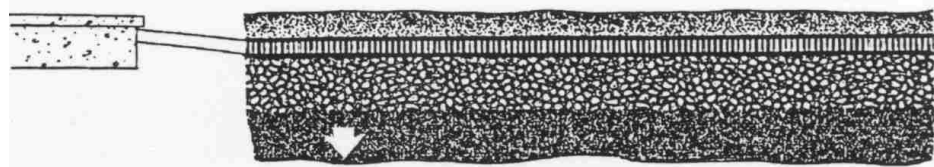
# How does a leaching system work?

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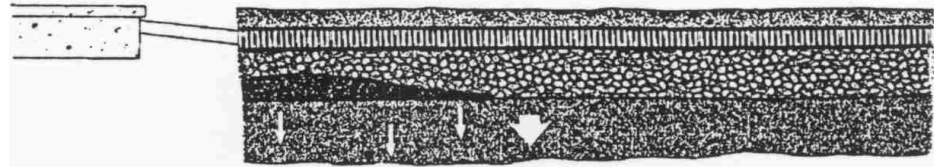
- Effluent from the tank is directed to the leaching system by the distribution piping.
- A layer of biological slime is formed on the interface between the soil and the leaching system surface (BIOMAT).
- The growth of the slime layer reduces the rate at which sewage passes into the soil.

# Formation of a Biomat (Gravity Distribution)

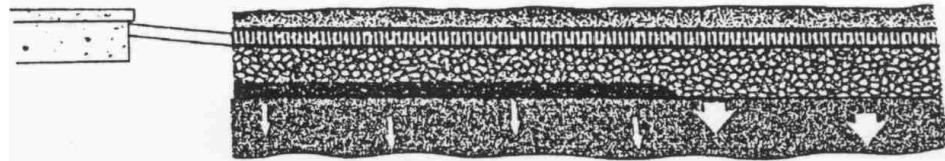
**One Day**



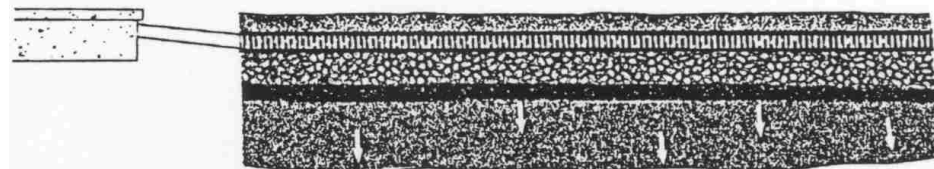
**1-3 Month**



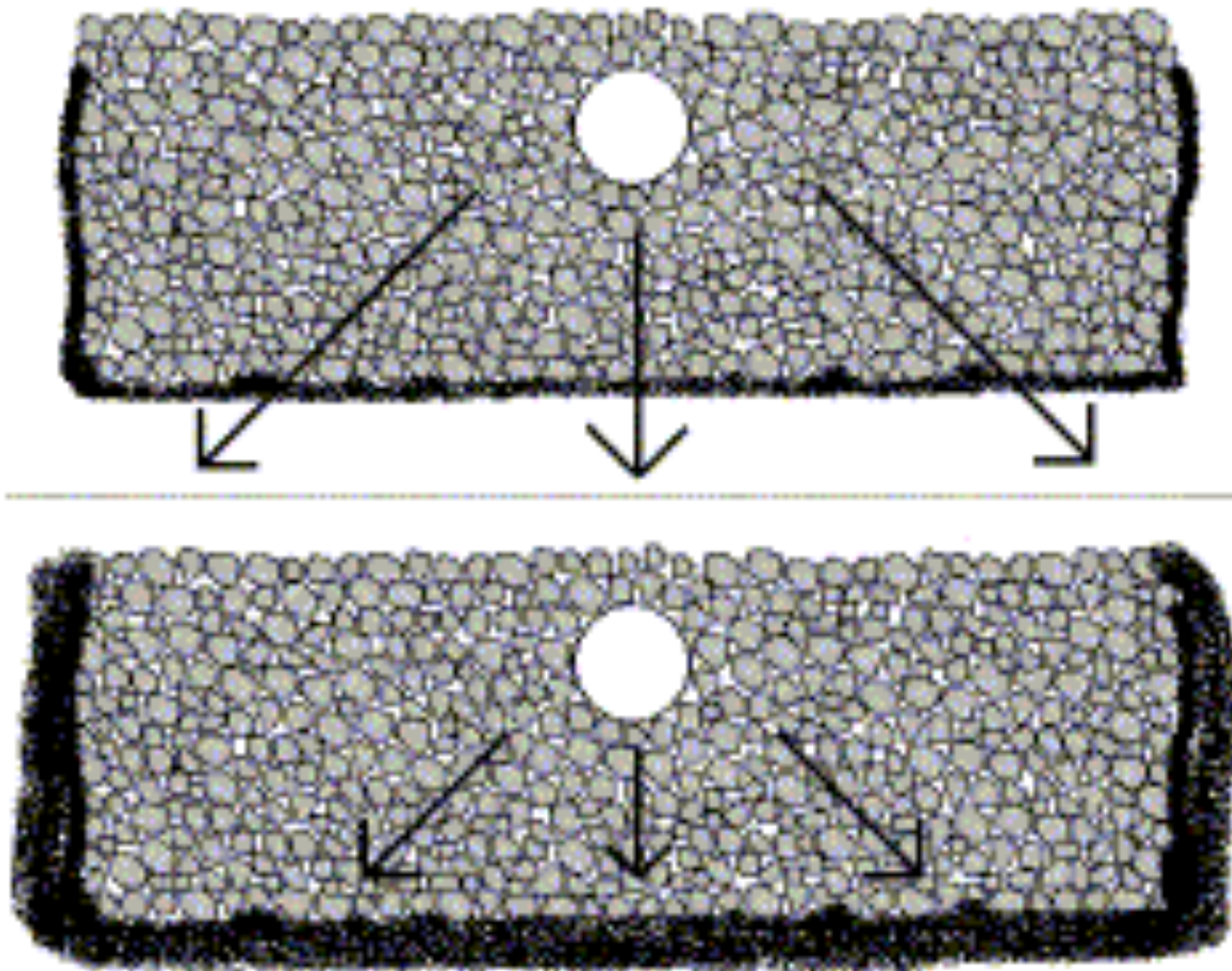
**3-6 Months**



**6 Months- 1 Year**



# Biomat Growth



# Stone Trenches



# Leaching Pit or Dry Well





# Galleries – 12-inch high

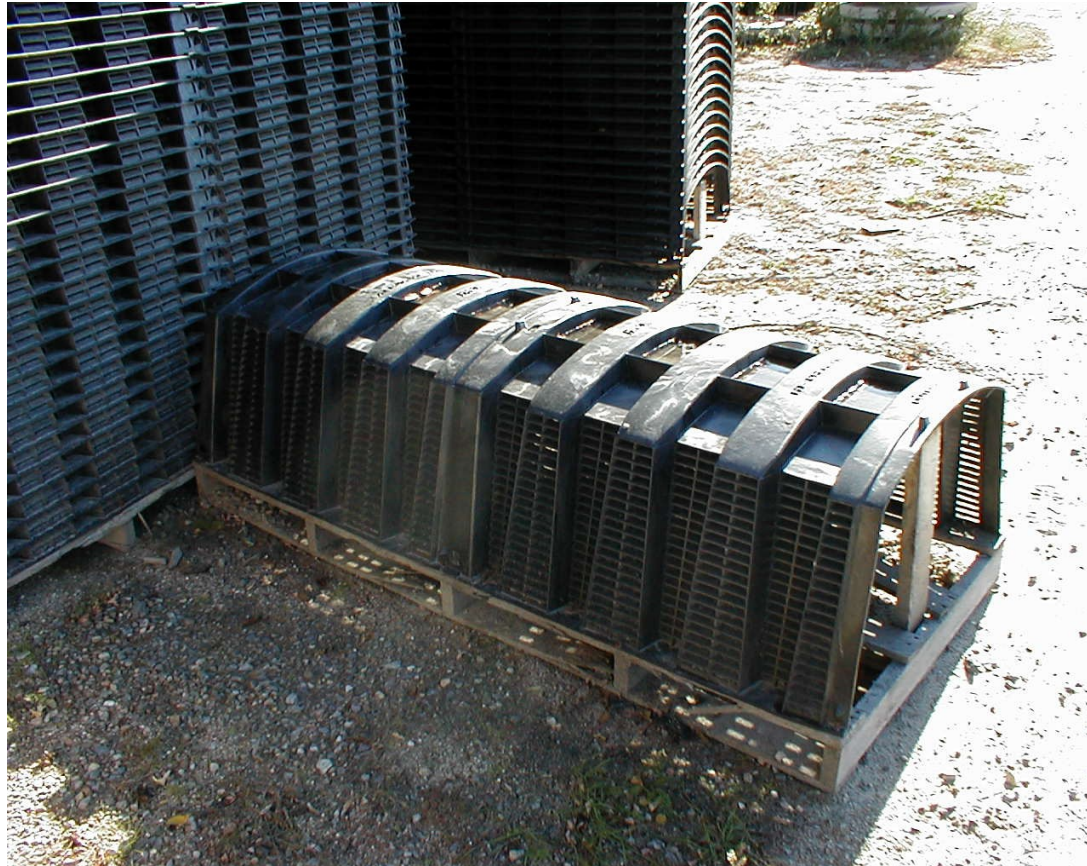


# Galleries – 4' x 4'

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# Plastic Chambers-Infiltrators





# Cultec

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# Form Cell: Living Filter



# Greenleach Filter





# Cur-Tech Systems

## Concrete Chambers



*Combination of concrete  
chamber and plastic parts*



## GeoMat Flat



Lay distribution pipe over system per design



Set form in trench

GeoMat Edge

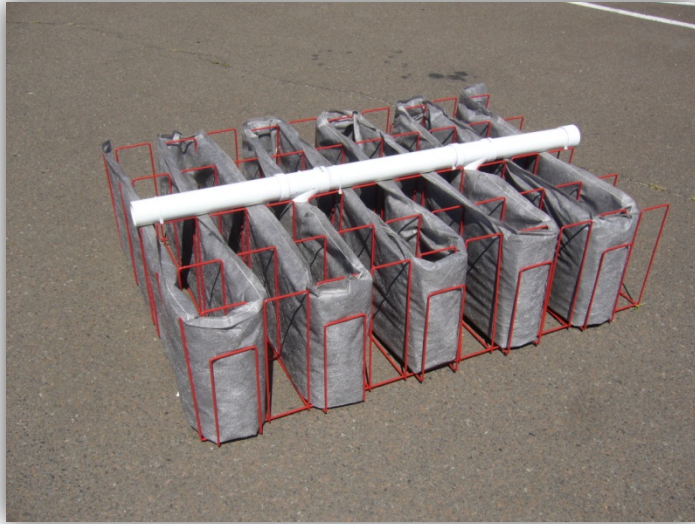
## GST Leaching System



Prepare site



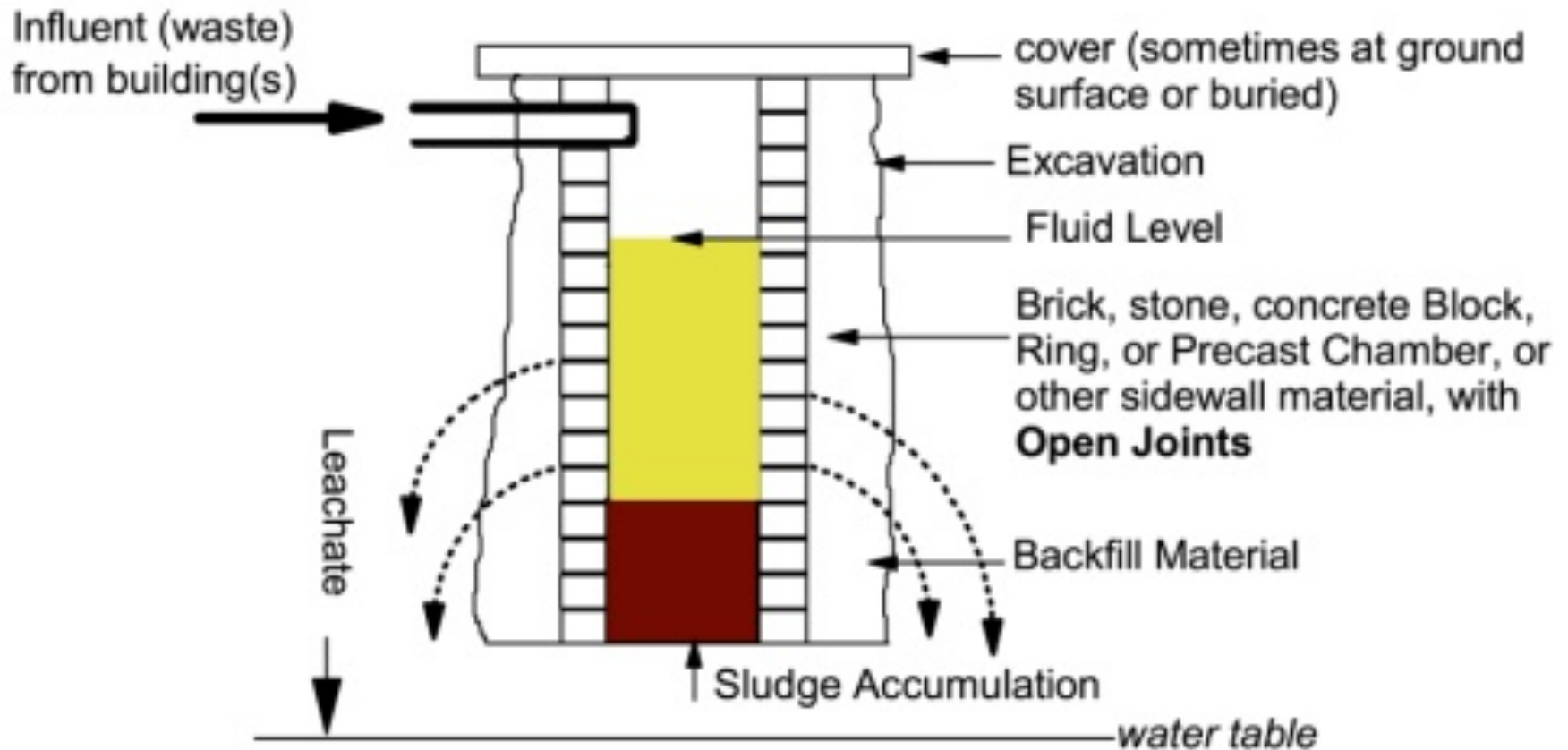
# S-Box







# Cesspools – Not Allowed





# SITING AND DESIGN





# How is a system sized?

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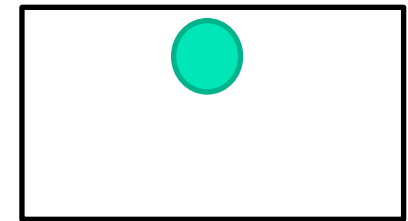
- Residential buildings
  - Number of bedrooms
- Commercial and non-residential buildings
  - Actual flow times a factor of safety
  - Design flow table



# Vertical Separation Distances

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- Bottom of the Leaching
  - 18" above water, redox or compact layer (restrictive layer)
    - 24" if a large system over 2000 GPD
  - 4' over ledge rock, 24" of which is natural



**18"**

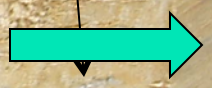
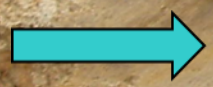
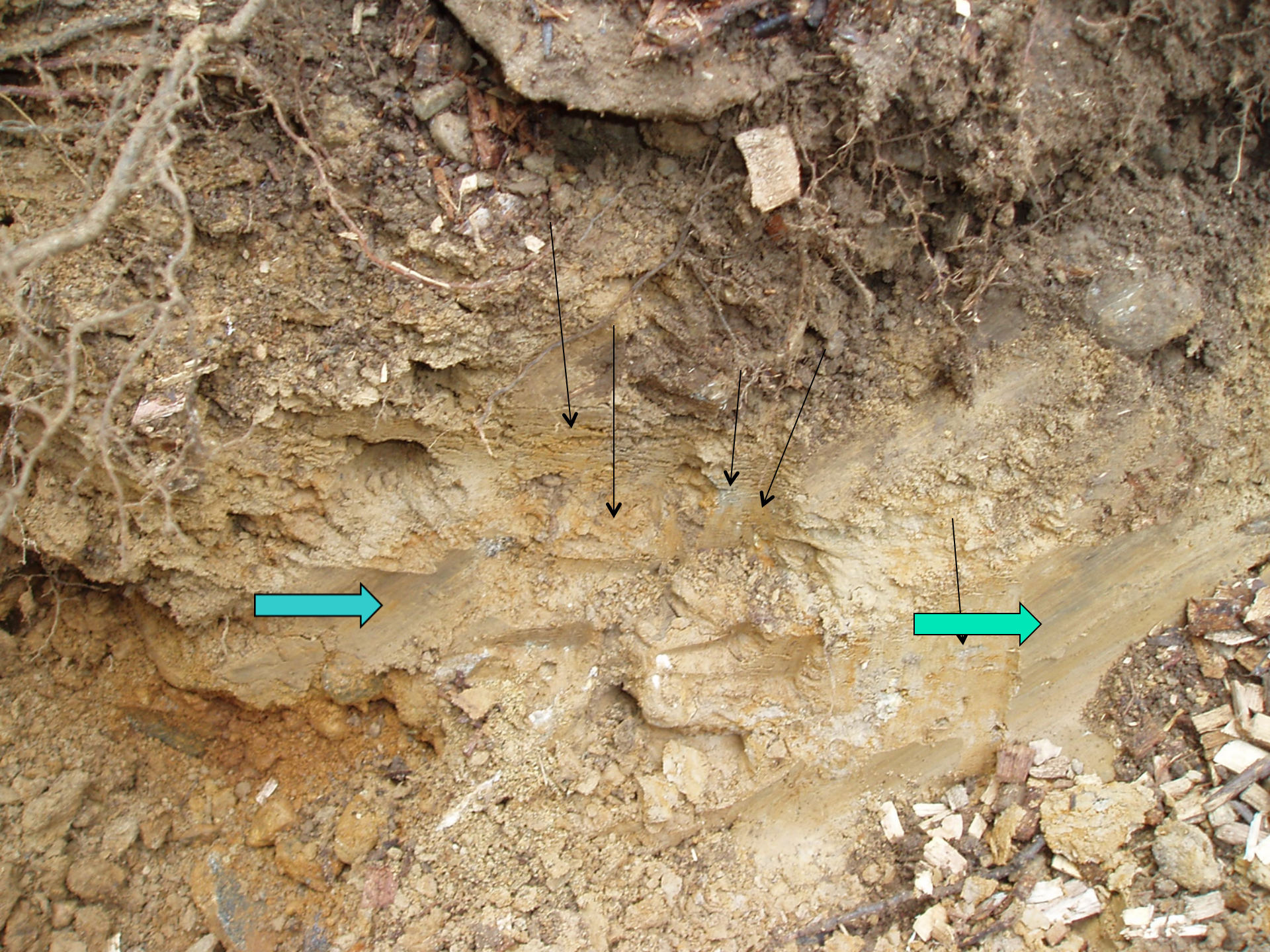
**Ground Water Layer**



# Vertical Placement

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- Utilize soil-based identification of redoximorphic (redox- discoloration of the soil indicative to seasonal high groundwater) features to identify groundwater
- Redox features form by the biogeochemical processes of reduction, movement, and oxidation of Iron and Manganese.



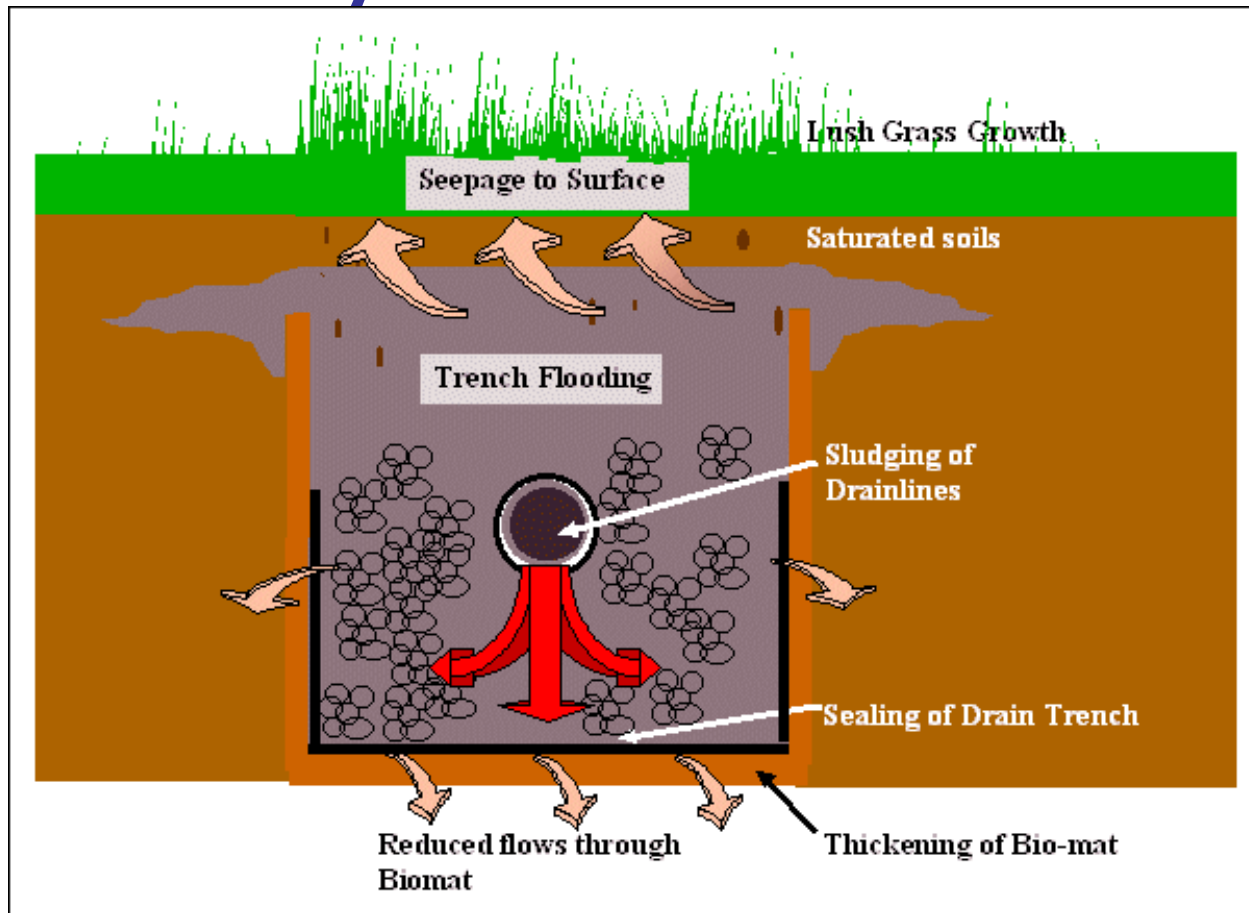


# Site Hydraulics

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- Important factor when designing a septic system
  - The naturally occurring soil surrounding leaching systems should be capable of hydraulically dispersing the entire volume of sewage effluent discharged into it on a continuous basis.

# System Failure



- Overtime even properly installed systems can experience difficulties if misused or not maintained.

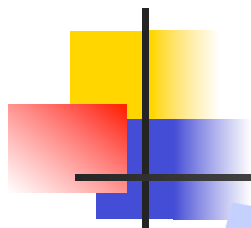






# Sewage Holding Tank





Thanks