

# Watershed Training Workshop

September 2017

Subsurface Sewage Disposal System  
Design and Function

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# Septic 101

- What is sewage?
  - Domestic Sewage
- Where does it go?
  - Different options for disposal
- What is a septic system?
  - System components and function
- How is a system located?
  - New and Repair
  - Vertical and horizontal distances

# Septic 101 cont.

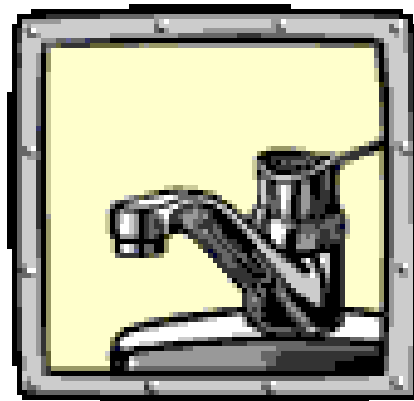
- What happens when my system stops working?
  - System Repair
  - Malfunctioning and failed system
  - Pollutants in domestic sewage
- How do I know my system is not working properly?
  - Signs of failure and malfunction

# What is Sewage?

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Domestic Sewage

# Domestic Sewage



# Domestic Sewage

- Water and human excretions
  - Toilets
  - Bathing water
    - shower
    - tub
  - Cooking and cleaning
  - Laundry
- Waste from restaurants and commercial buildings

# Where does it go?

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What happens when we flush?



# How we dispose sewage?

- Where does it go?

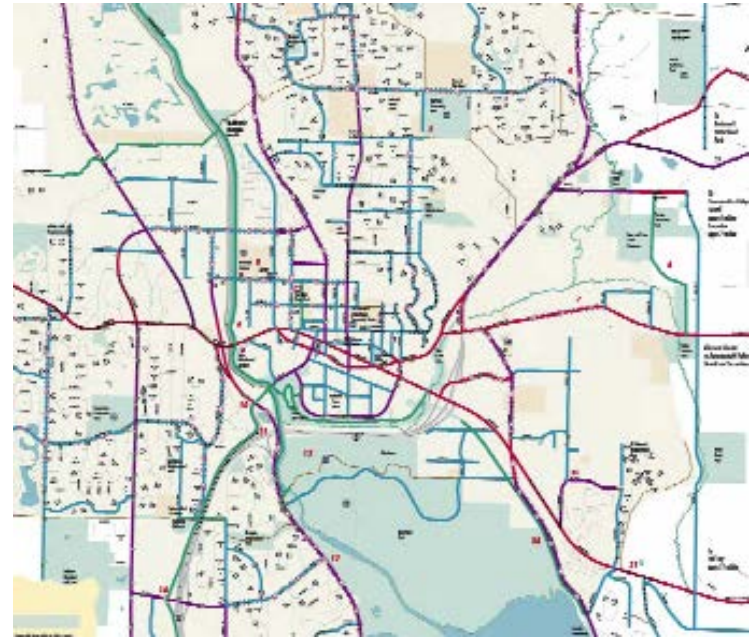


# Methods of Sewage Disposal

- Public Sewers: municipal treatment plant
- Conventional “Septic Systems”
- Alternative or Advanced Treatment Systems

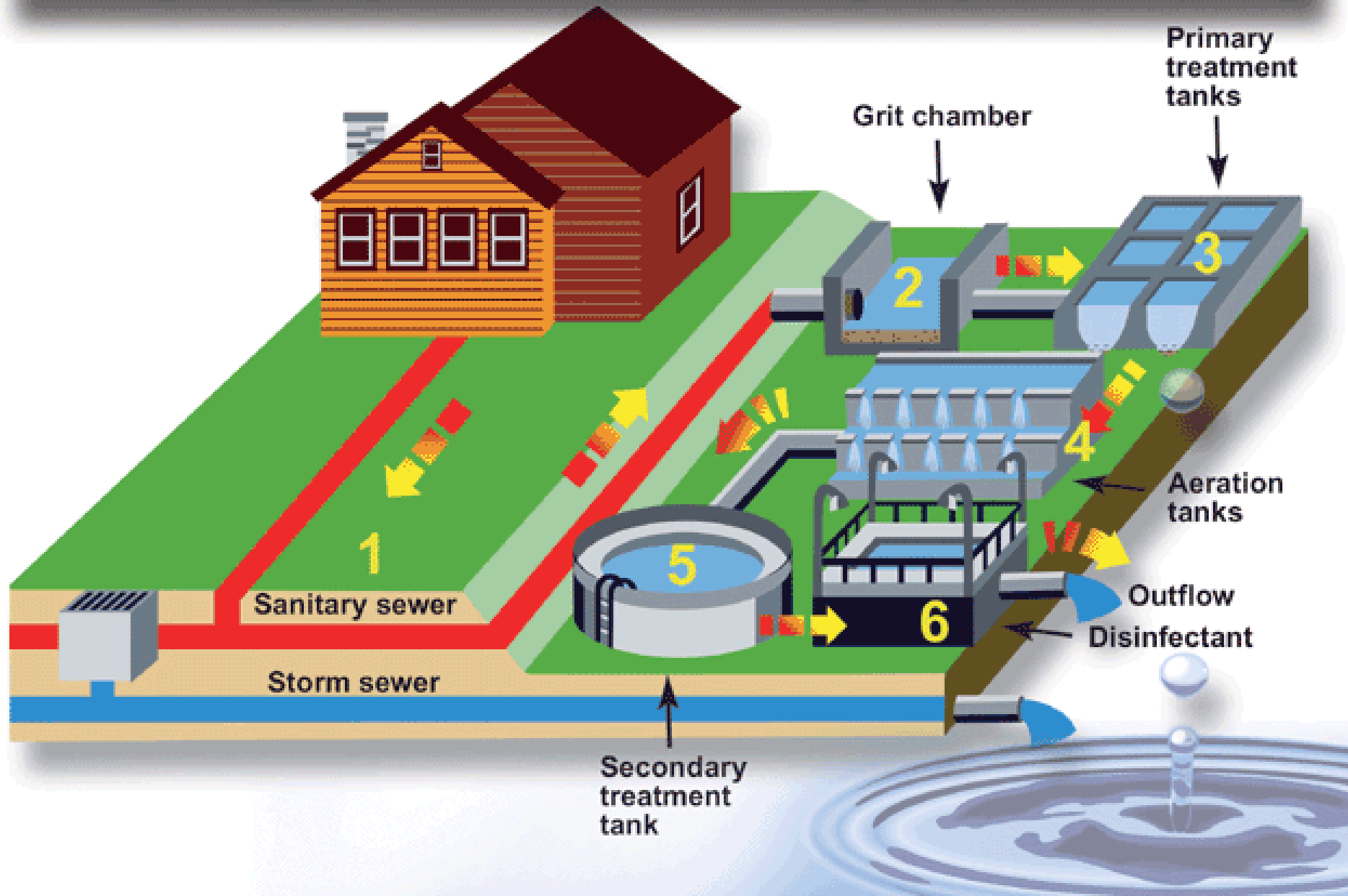
# Public Sewers

- Serves approximately 70 percent of the CT population
- Predominantly in urban areas and area of high density development





# Typical sewage treatment process in Canadian municipalities



# Conventional “Septic Systems”

- Served approximately 1 million people in CT
- Subsurface Sewage Disposal Systems

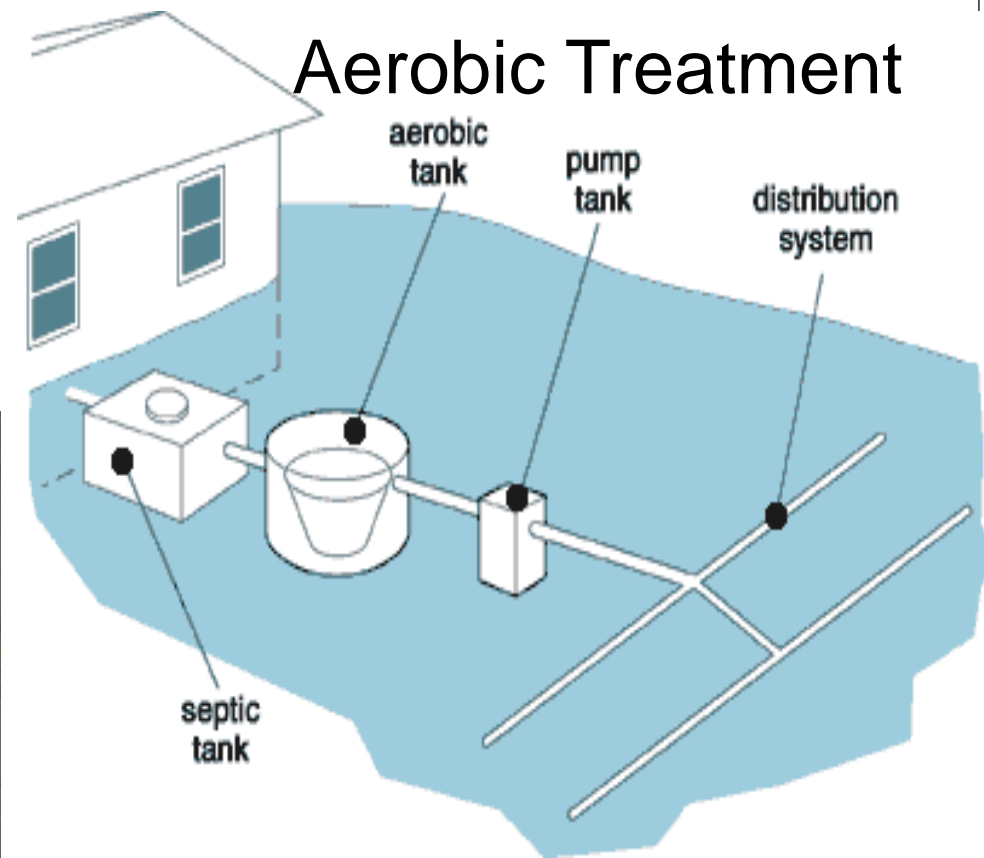




# Alternative Treatment Systems

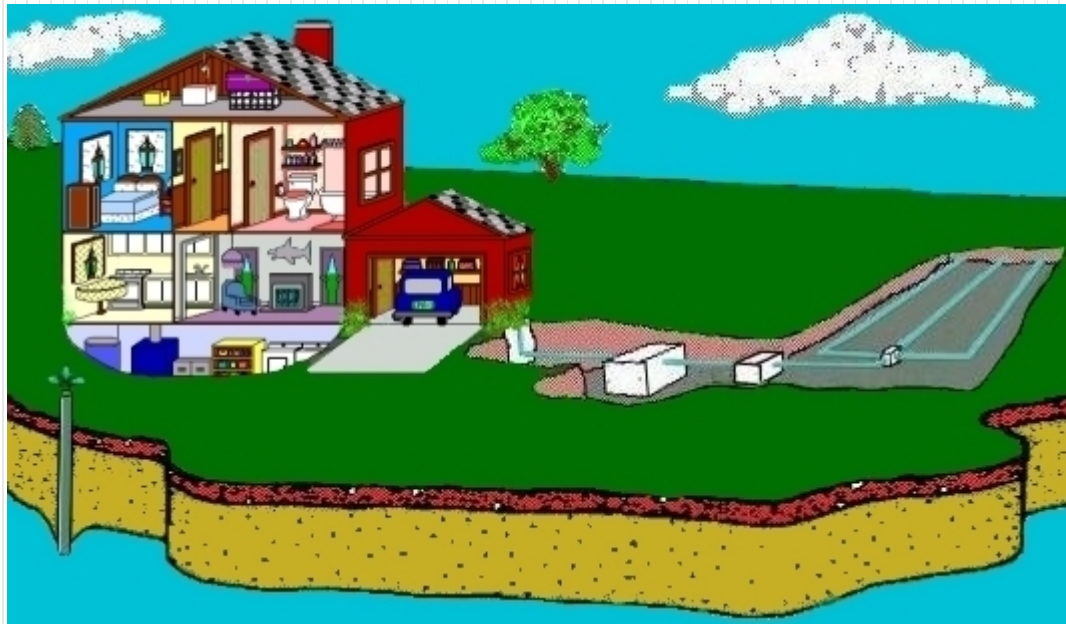
- **Wastewater Management District Legislation** may allow for broader use
- **Requires DEEP permit**

## Intermittent Sand Filter



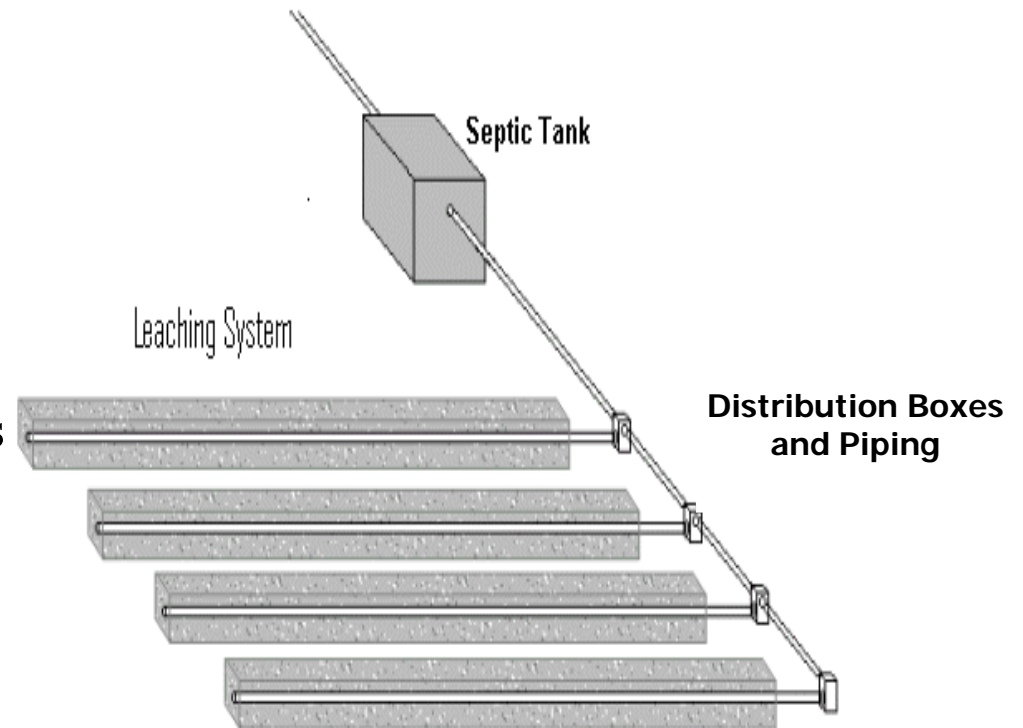


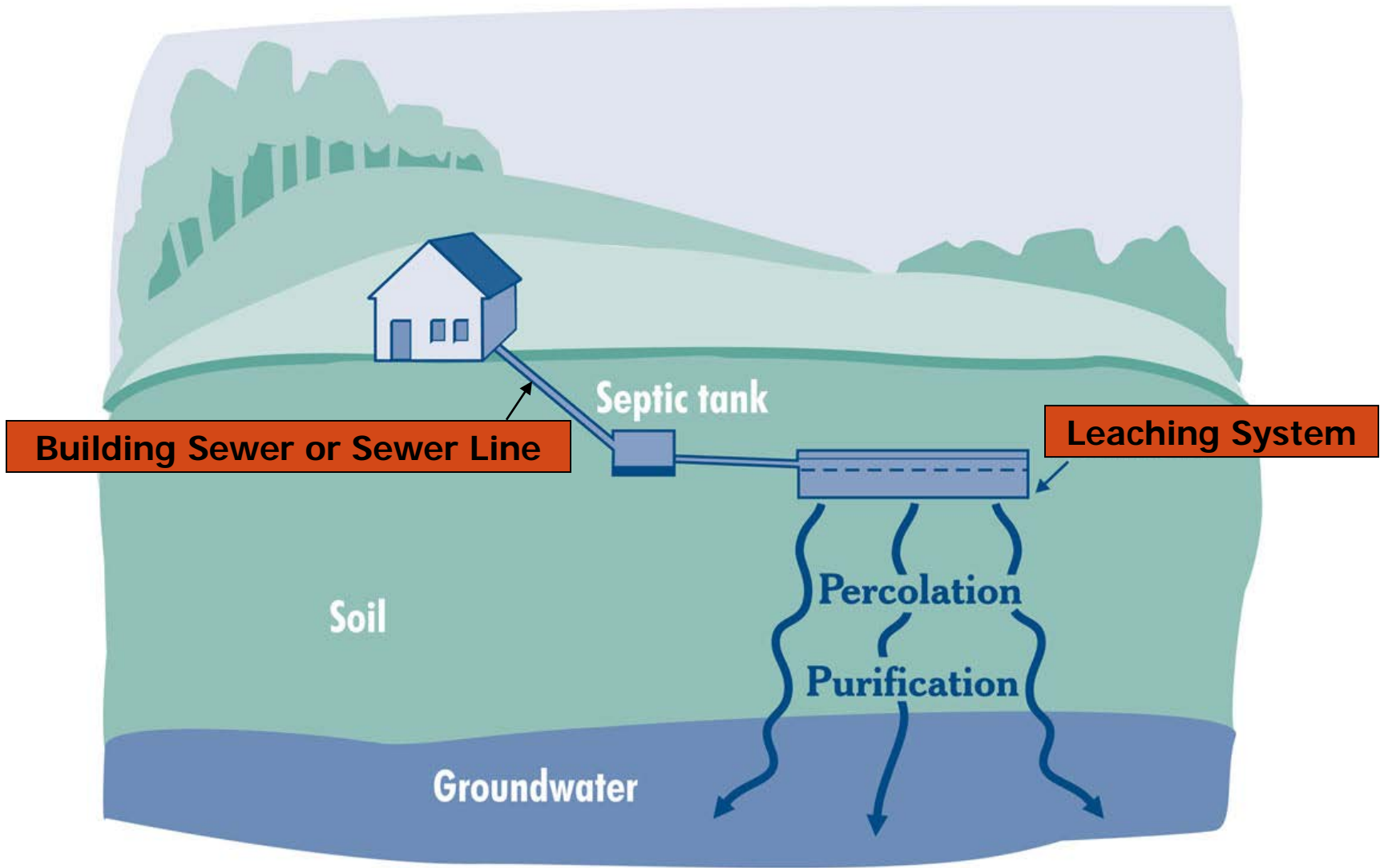
# What is a Septic System?

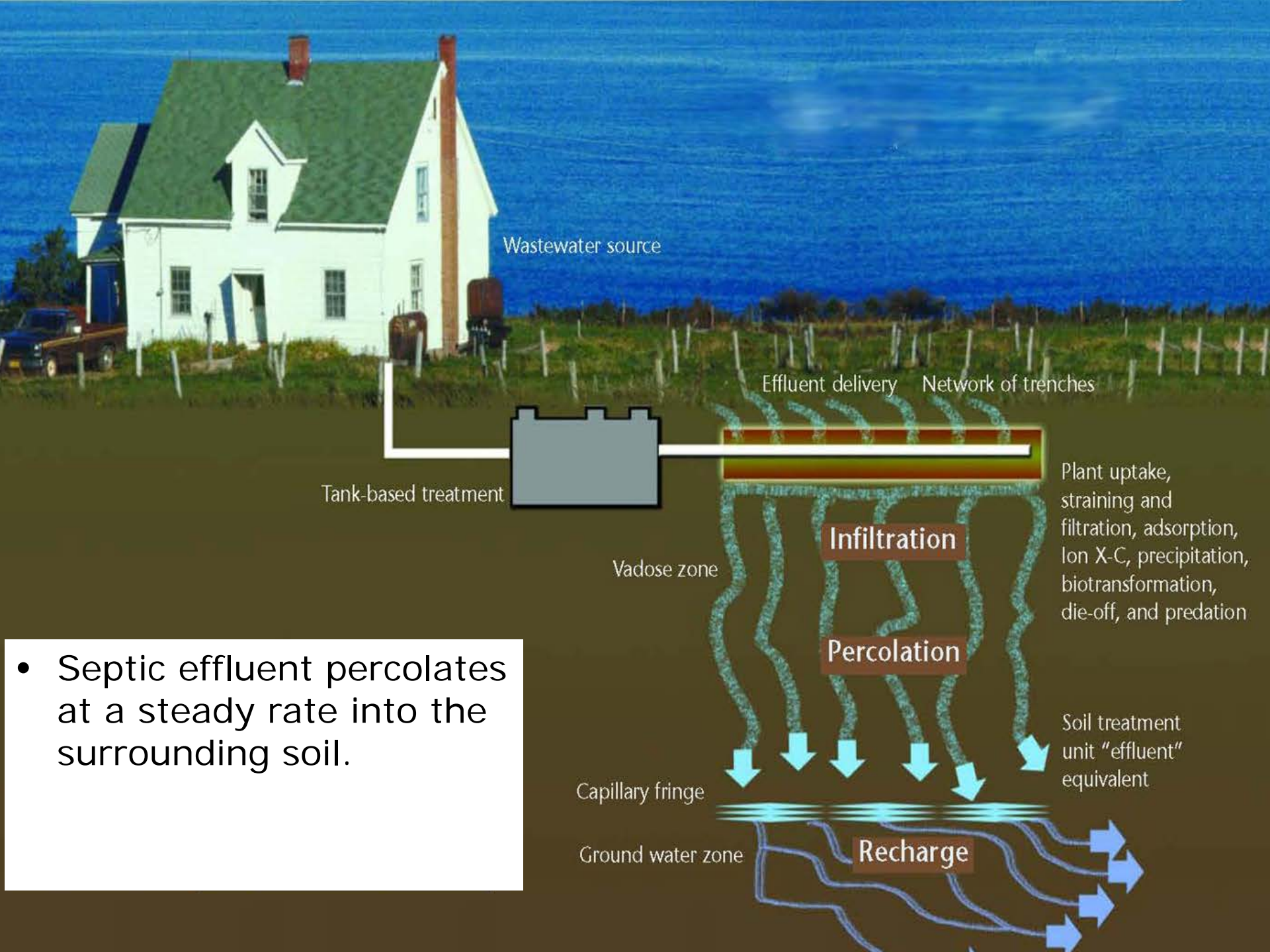


# System Components

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





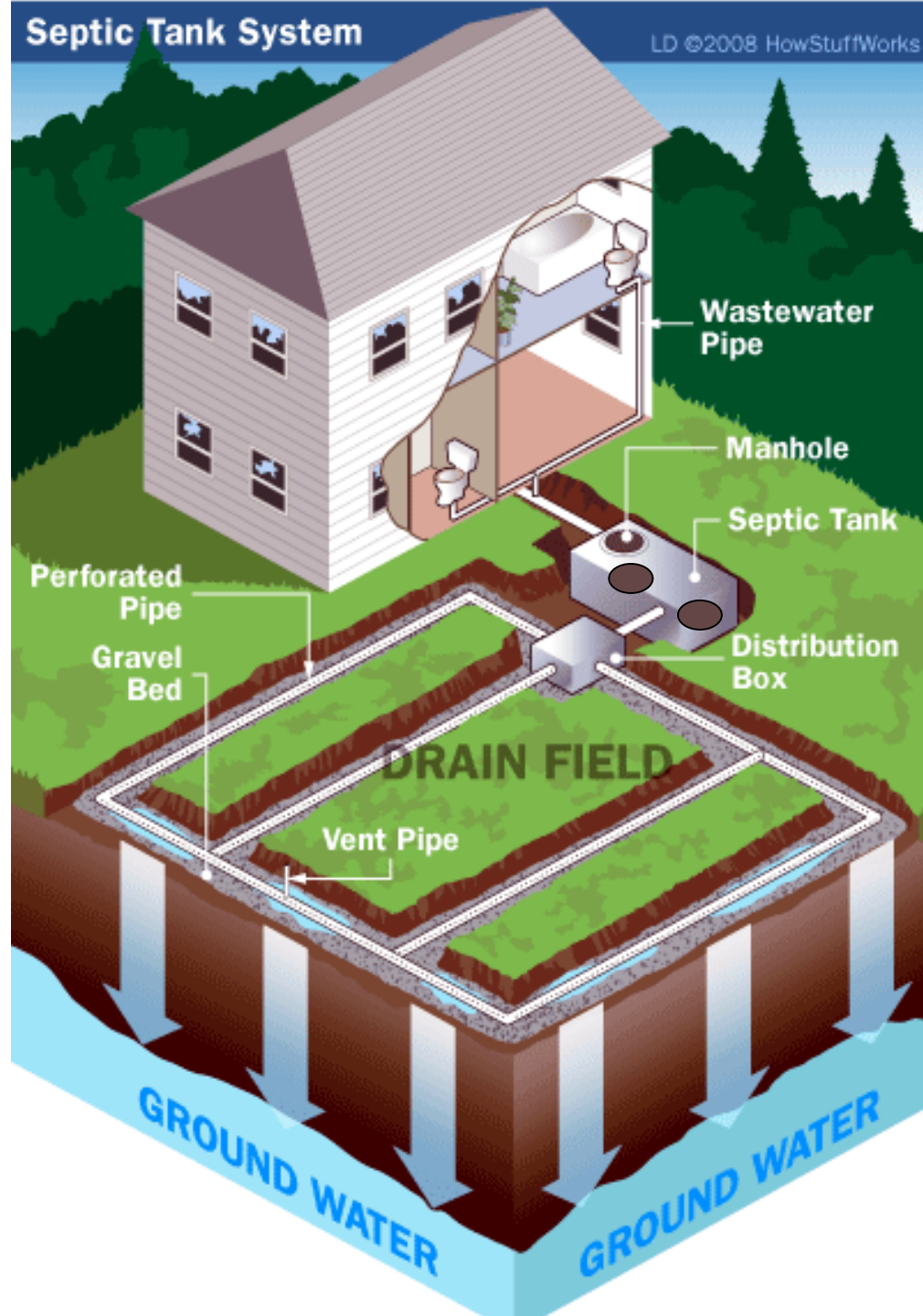


- Septic effluent percolates at a steady rate into the surrounding soil.



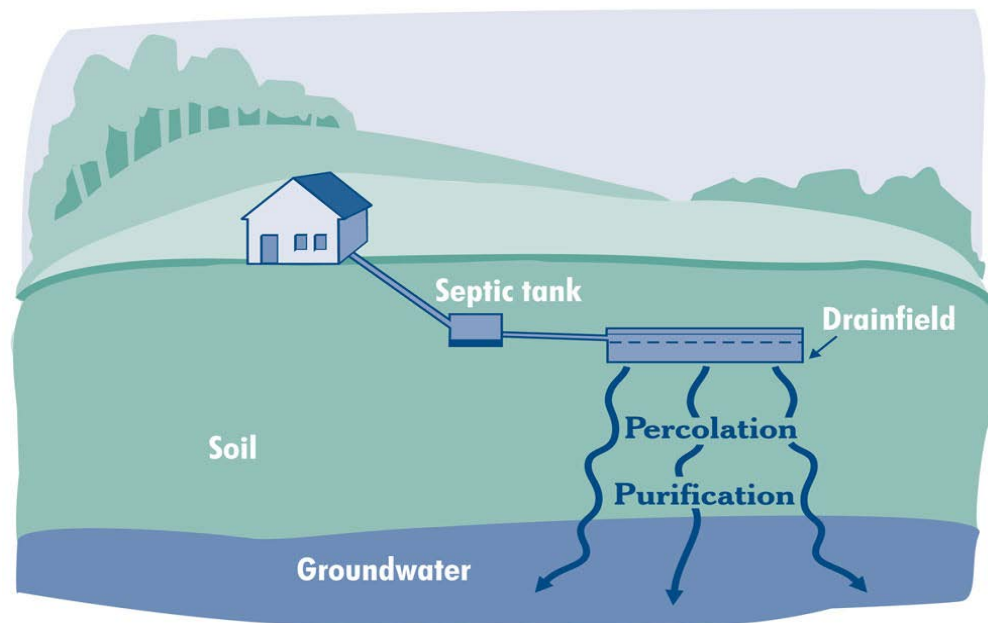
# Septic Tank System

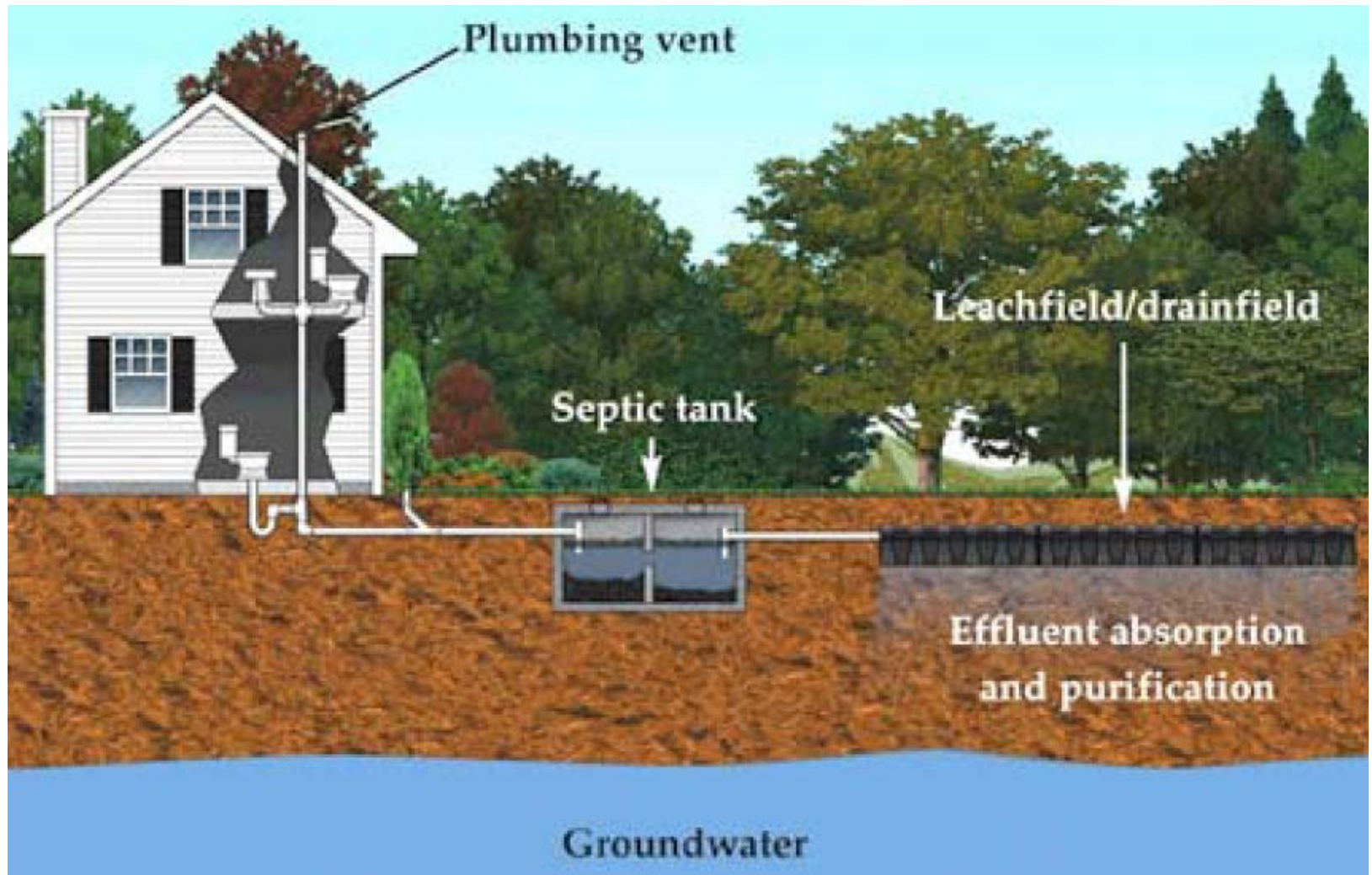
LD ©2008 HowStuffWorks



# Building or House Sewer

- Refers to the pipe located between the building served connecting to the septic tank







# Septic Tank

- Provides the primary treatment: separates, settles and digests



# Septic Tank



# Distribution Piping

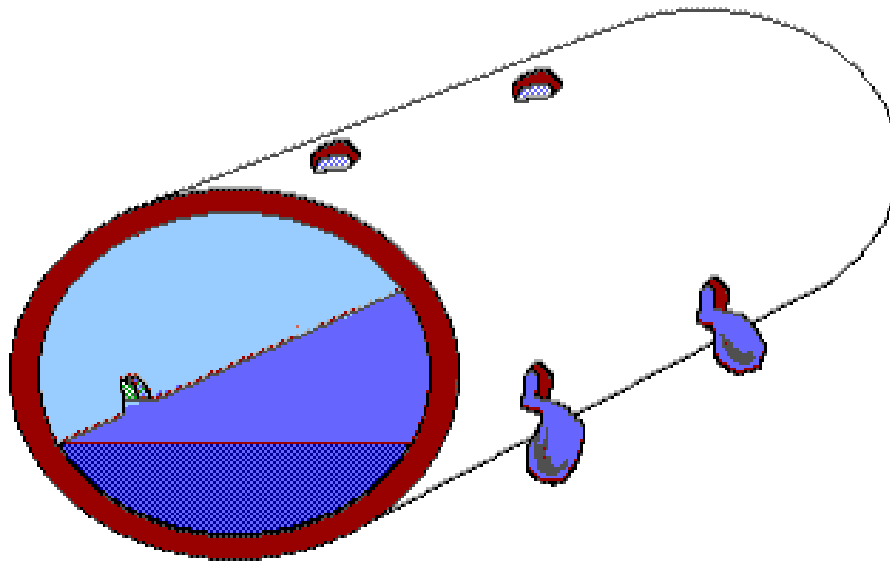
- Consists of the piping leading from the septic tank to the leaching system.



# Distribution Box



# Perforated Piping



**4" Diameter  
Distribution  
Piping**

# Leaching System

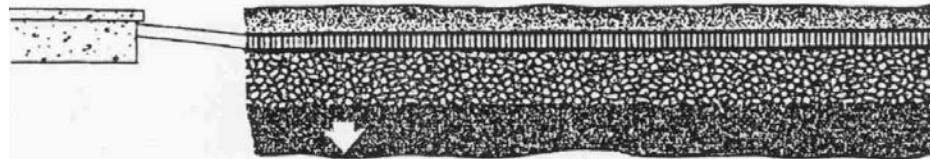
- Properly functioning leaching system should disperse effluent (liquid from the septic tank) into the surrounding soils without breaking out on the ground surface or polluting the groundwater.

# How does a leaching system work?

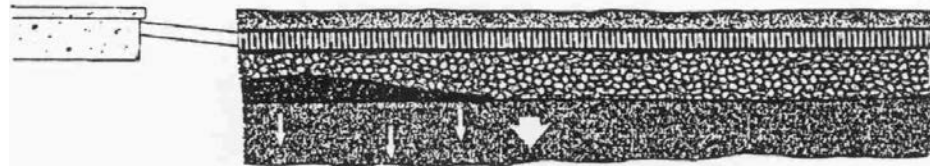
- Effluent from the tank is directed to the leaching system by the distribution piping.
- A layer of biological slime is formed on the interface between the soil and the leaching system surface (BIOMAT).
- The growth of the slime layer reduces the rate at which sewage passes into the soil.

# Formation of a Biomat (Gravity Distribution)

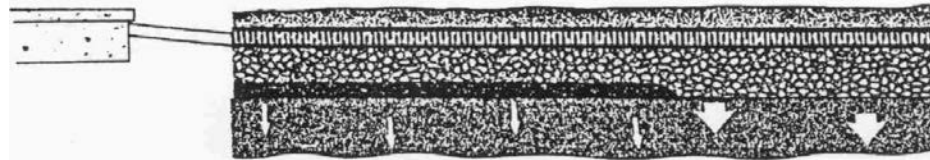
One Day



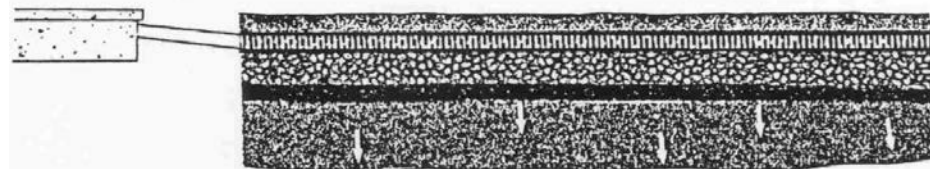
1-3 Month



3-6 Months

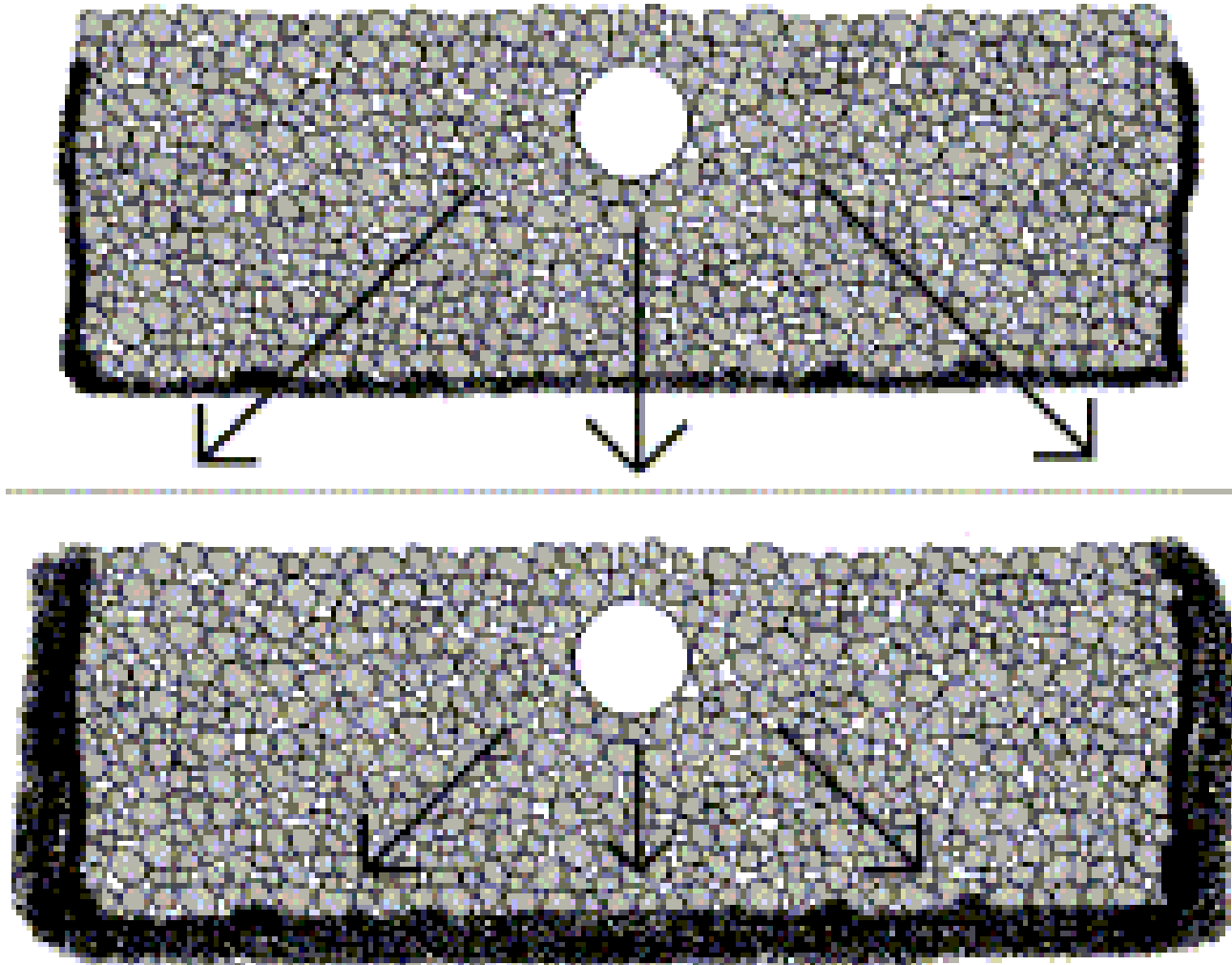


6 Months- 1 Year





# Biomat Growth



# Leaching Types

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

# Stone Trenches



# Leaching Pit or Dry Well





# Galleries - 12-inch high





# Galleries - 27-inch Teepees





# Galleries – 4' x 4'





04.17.2009



04.17.2009

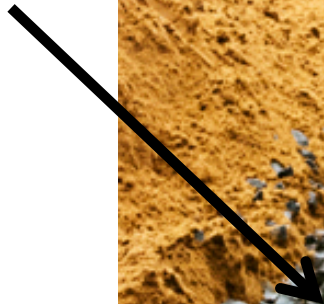
# Plastic Chambers







**12" of Stone**



# Cardboard











## Low Pressure Distribution System





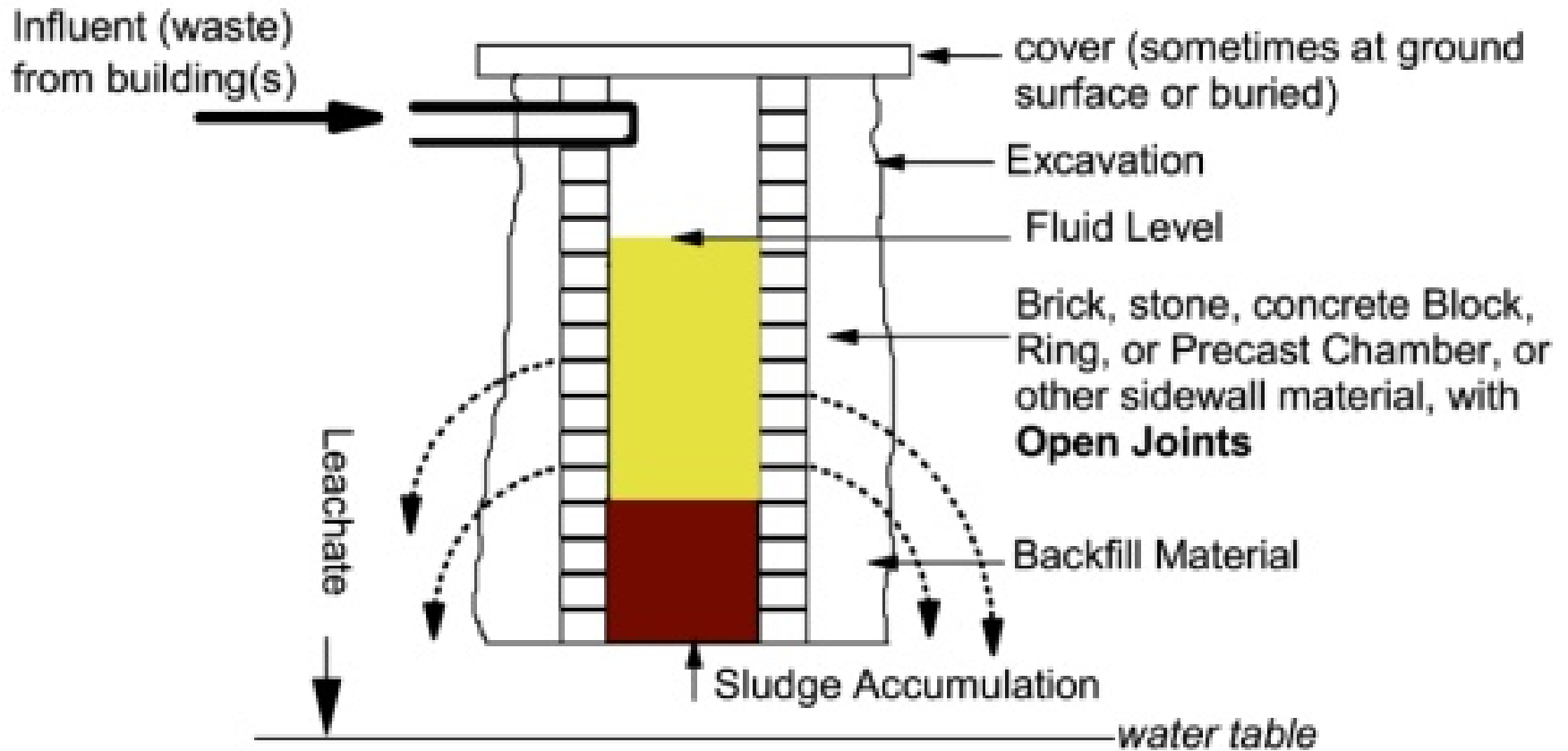








# Cesspools – Not Allowed in current code. Many still exist.



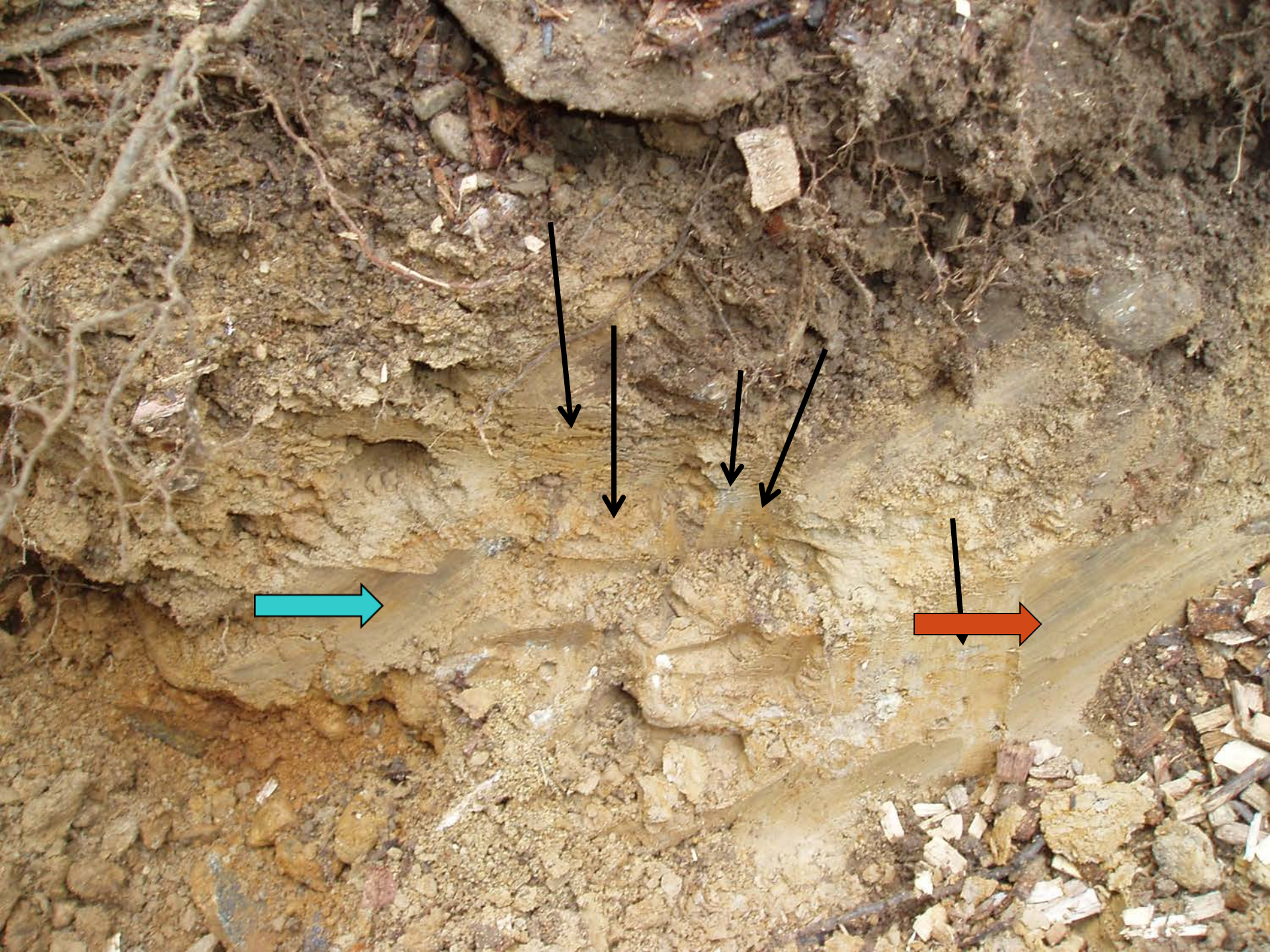
# How are systems located?

Where should my system go?

# New and Repair Systems :Vertical Placement

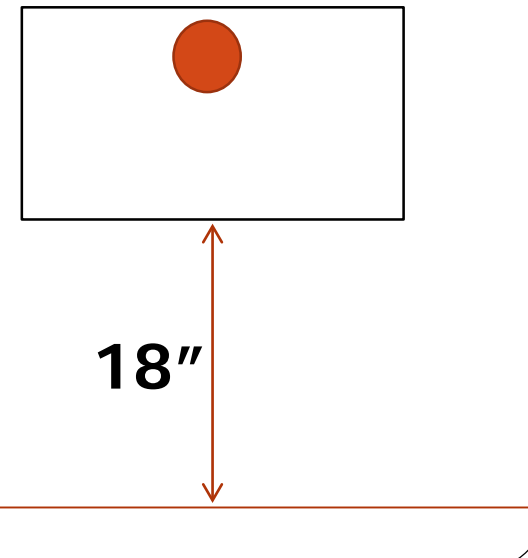
- Utilize soil-based identification
- What we look for:
  - Color variations in the soil
    - Biogeochemical processes of reduction, movement, and oxidation of Iron and Manganese
  - Actual ground water measured during the wet season
  - Ledge rock
  - Compact soils
  - Any layer that restricts the downward movement of water





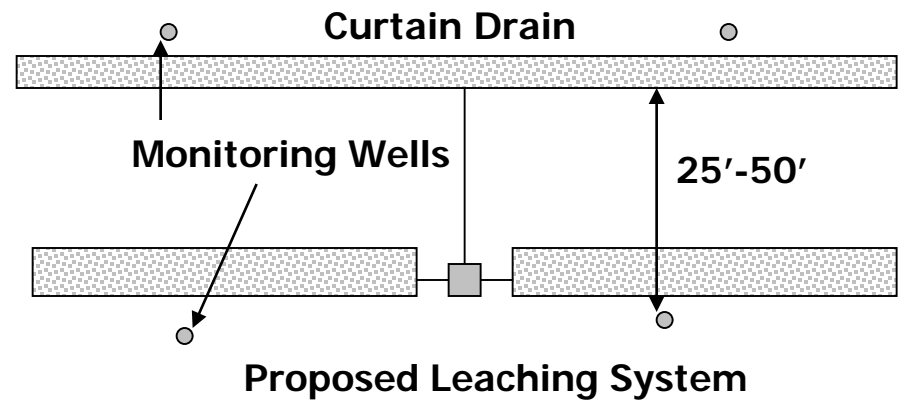
# Vertical Separation Distances

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



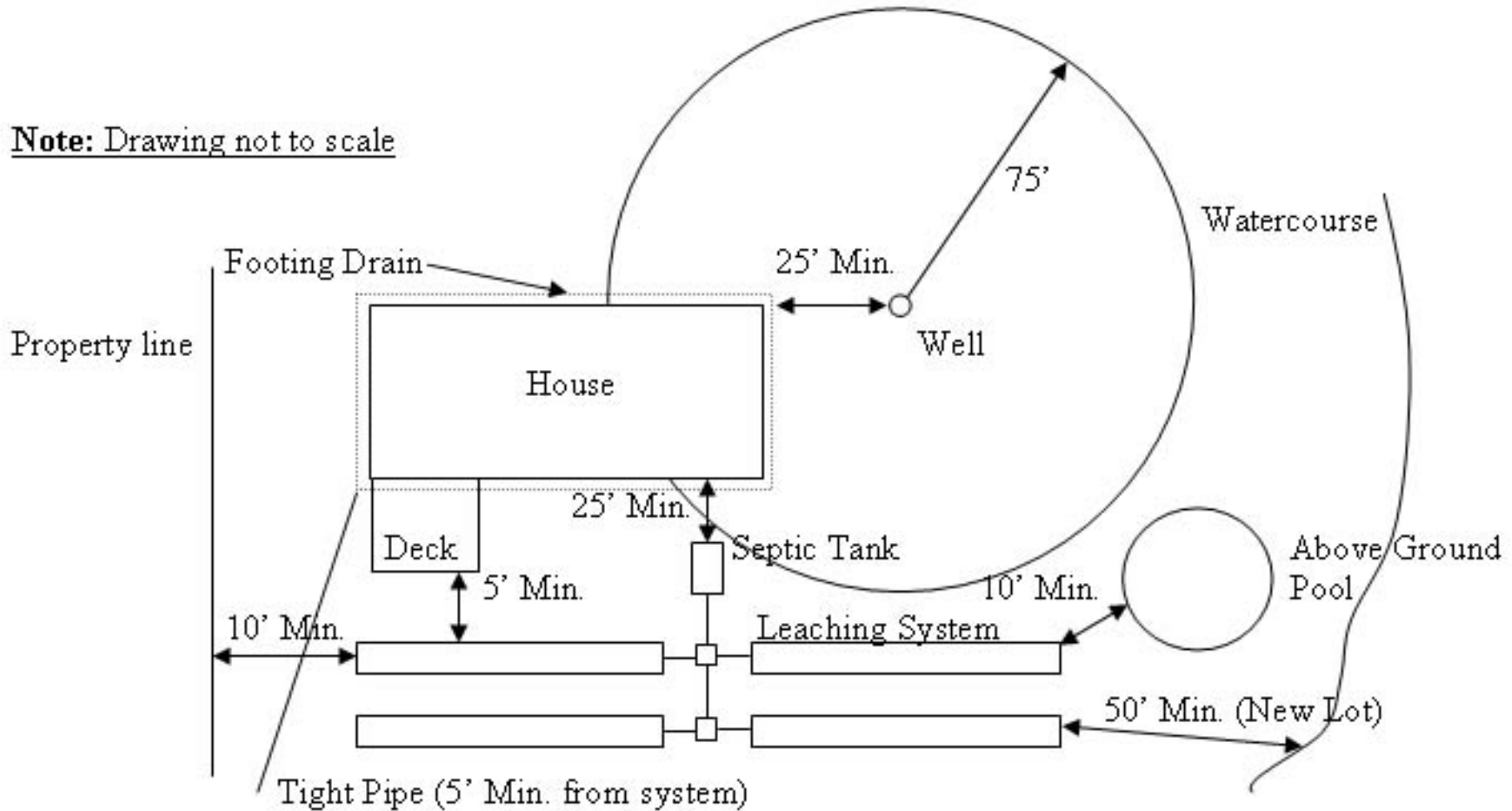
# Groundwater Monitoring

- Wet season monitoring
- February 1 to May 31



# Horizontal Placement: New Systems

Note: Drawing not to scale



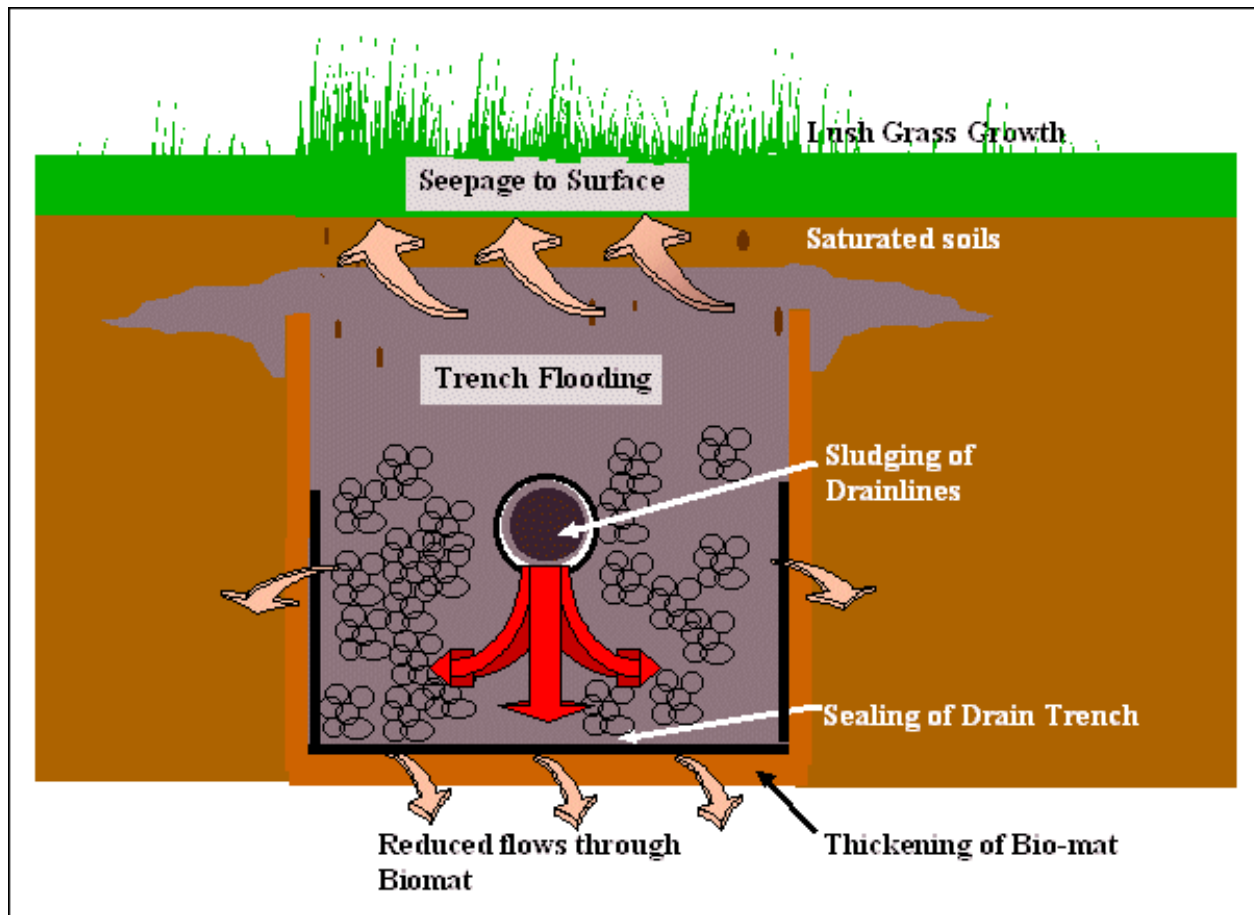


# What happens when a system stops working?

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# When a repair is needed

- “Malfunctioning System”
  - Backflow into the structure
  - Backflow into the septic tank at time of tank cleaning
    - Minor system repair
      - Pipe crushed
      - Effluent filter clogged
      - Improper use of the system
        - Flushing newspaper or kitty litter
- “Failed” systems discharge effluent to ground surface or otherwise cause health hazards or nuisance conditions.



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

# Pollutants in Domestic Sewage

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

# Bio-Chemical Oxygen Demand

- 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

- 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

- 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.

# Phosphate

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



# 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



# Chemical Pollutants in Sewage

- 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



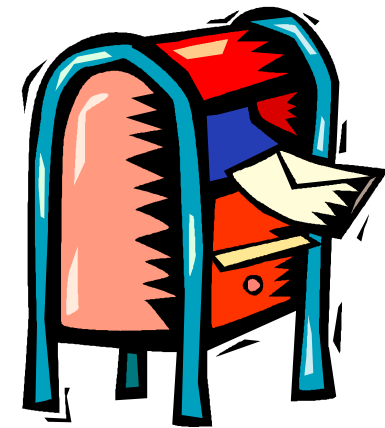
# How do I know the system is not working properly?

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What is that smell?

# Before Inspecting

- Notify the local health department
  - Where and when
    - People may call
    - Findings
- Notify the public
  - Add in the local paper
  - Post card
- Do your research
  - Visit the local health department
  - Where are the systems located?



# Signs of Problems



- Patches of lush green grass or pooling of wastewater on the ground surface.
- Sewage overflowing on to the ground surface needs immediate attention.
- Call Local Health Department to report septic failures and problems with any septic system.
  - Locals can issue orders to correct failure
- Take photos
  - A picture is worth 1000 words!





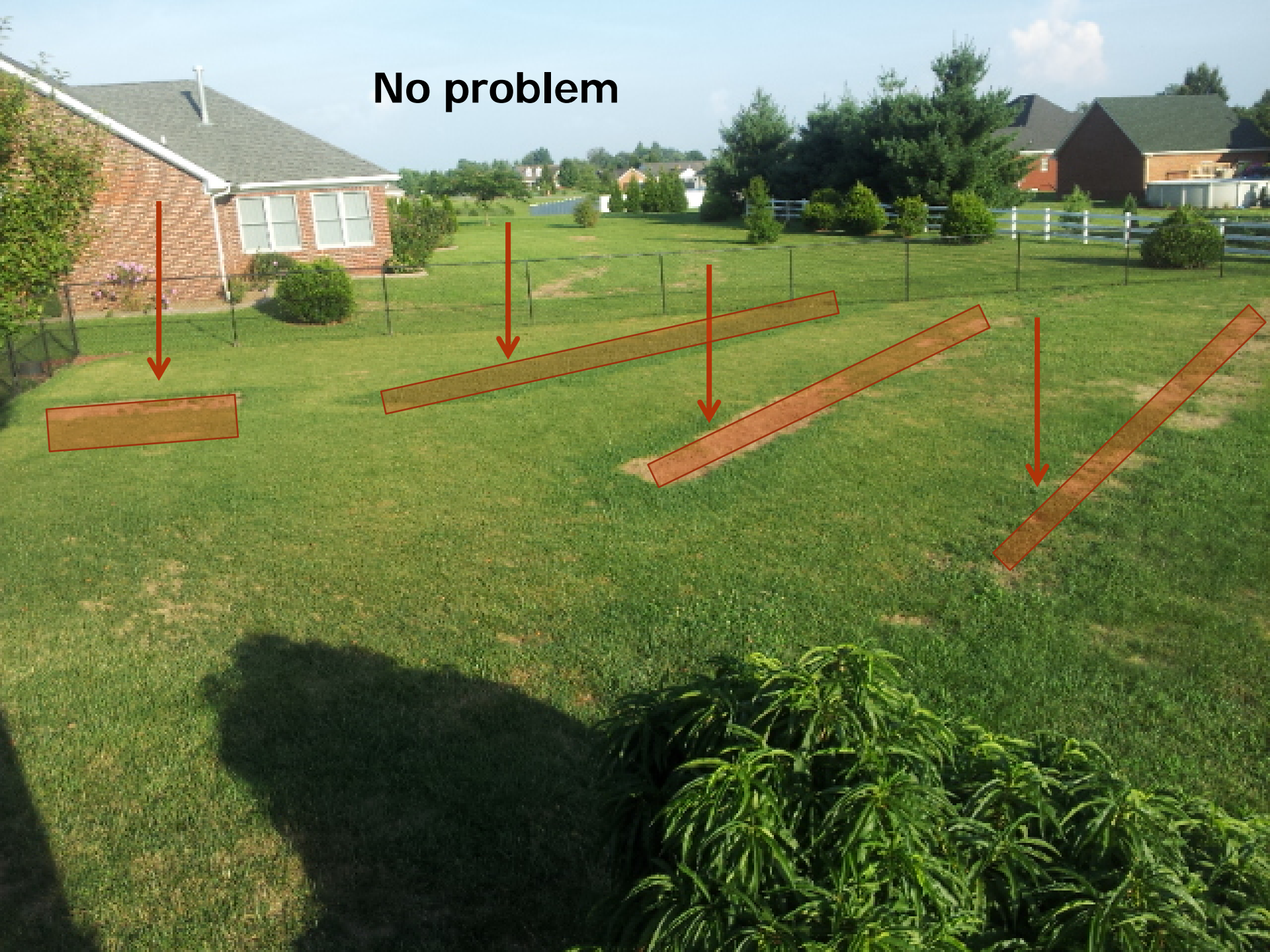








No problem

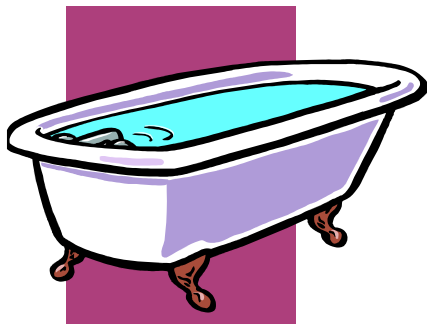




# Signs of a problem



- Runback from the leaching fields into the septic tank after pumping could indicate a problem with the leaching portion of the system.
- Large volume discharges cause either a backup or an overflow of sewage above the septic tank or leaching field.
  - This condition is usually at its worst during and/or directly following a heavy rain event and in times of high groundwater.



# Use your nose

- Foul septic odors in storm drainage piping, catch basins, footing drain piping or curtain drain discharges may indicate that sewage is entering these groundwater systems.

