

Drip and Spray Water Distribution as a Water Reuse System

Bruce Lesikar
Filtration Application Engineer
United Rentals

Overview

- Water resources and the hydrologic cycle
- Site water management
- Rainwater Harvesting
- Indoor Water Reuse
- Graywater
- Drip distribution
- Spray distribution

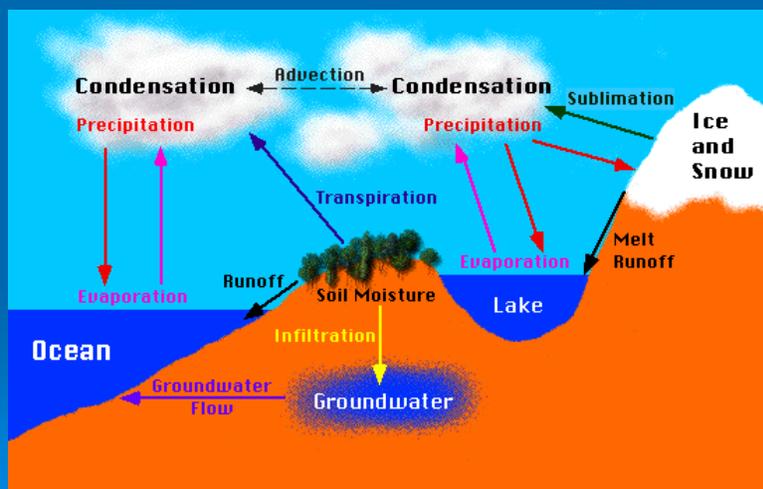
Do we have any unused water?

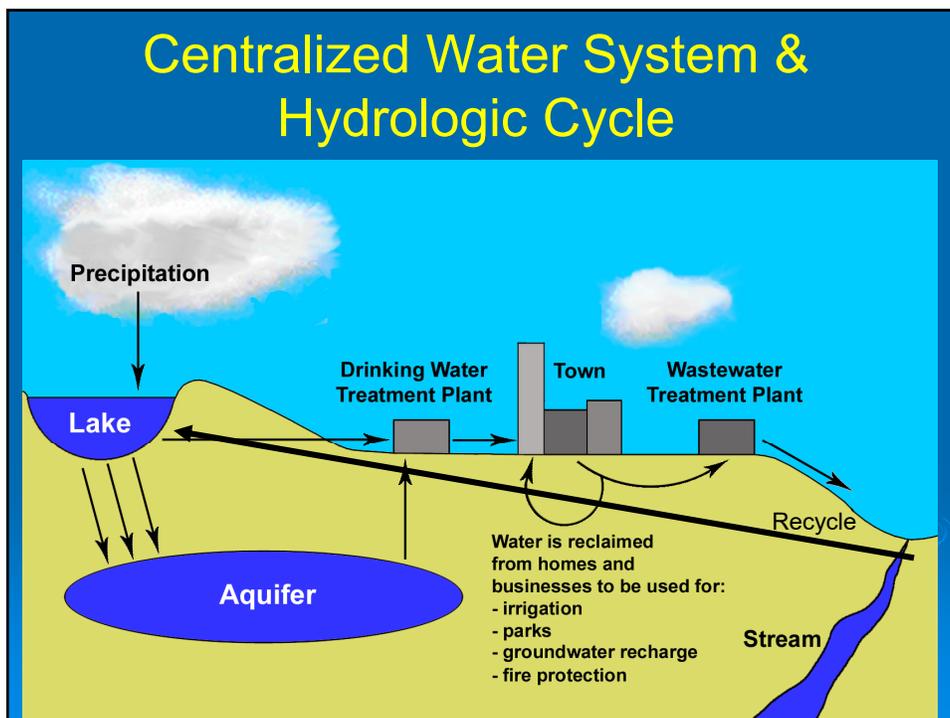
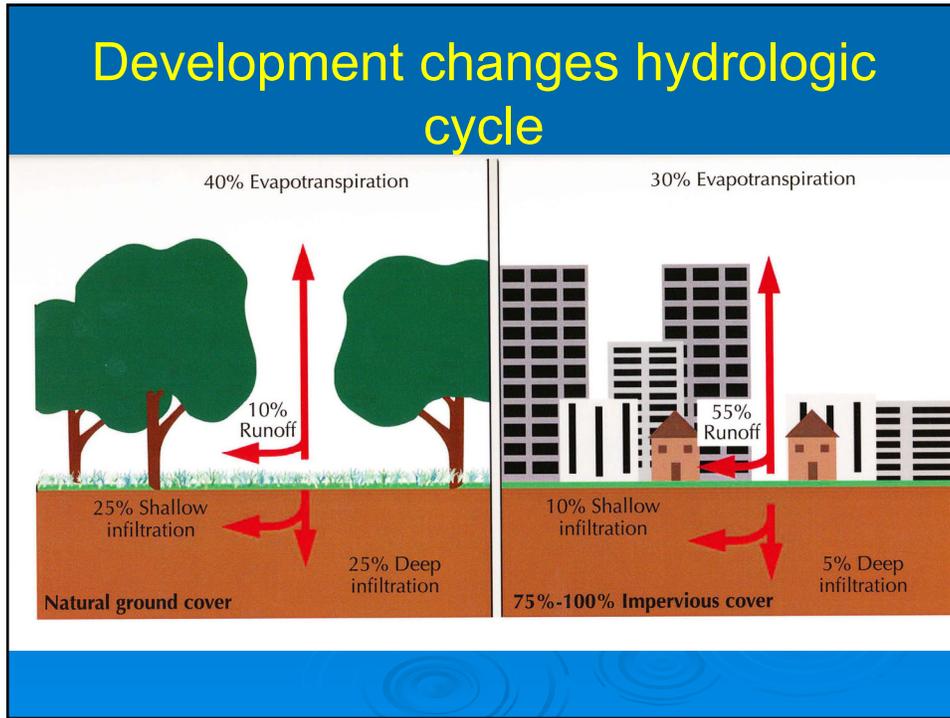
➤ No!!!

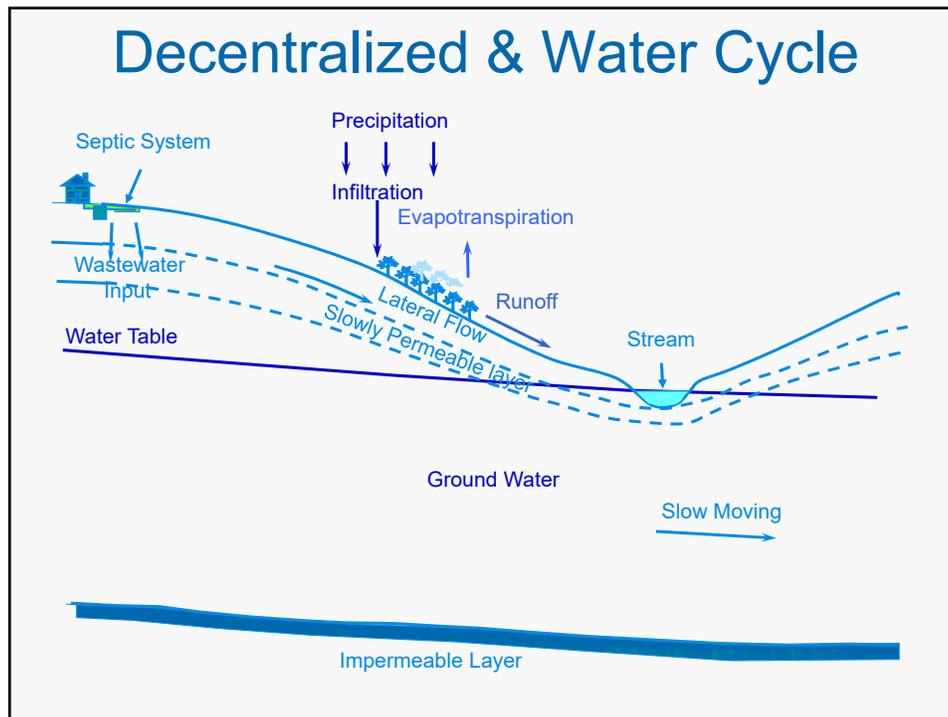


➤ Water Conservation – Management of our water resources, efficient use, water quality protection

Hydrologic Cycle







Site water management

- Potable water
 - Groundwater - well
 - Rainwater harvesting
 - Surface water
- Condensate – air conditioning drain
- Graywater
- Treated wastewater



How rainwater harvesting works

- A rainwater harvesting system consists of:
 - Water source
 - Rainfall
 - Collection
 - Impervious surfaces: runoff occurs immediately
 - Diversion
 - Gutters and downspouts, piping
 - Storage
 - Tanks
 - Water use
 - Plants, animals, people

How much rainwater can be collected?

- P **Roof – metal is best but any will work**
- P **0.6 gallons per square foot of roof**
- P **2,000 sq. foot roof X 1" rain = 1,200 gal. water**
- P **1,200 gal. X 20" rainfall per year = 24,000 gal/yr**

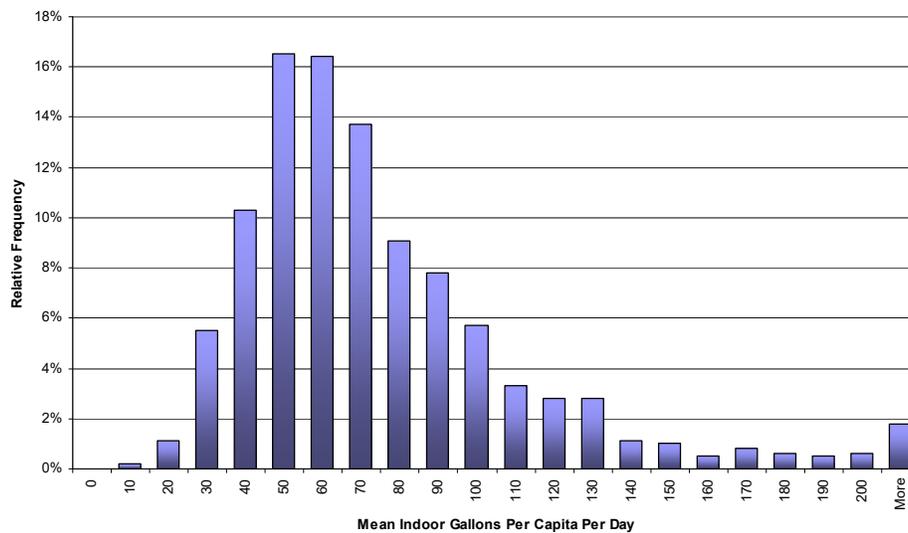


Residential Water Demand



- Owner controls water usage
- Total water usage is proportional to the number of people served
- Water using fixtures impact the total quantity of water used.

Distribution of mean household daily per capita indoor water use for 1,188 data-logged homes (EPA 2002: Onsite Wastewater Treatment System Manual)



Total water usage = Number of people x indoor water usage per person

Wastewater Reuse

- Goal: careful use of a valuable resource
- Wastewater vs water
- Non-potable uses
 - Landscape reuse
 - Toilet flushing
 - Clothes washing
- Management: O&M is even more critical



Graywater Reuse & Wastewater Loading

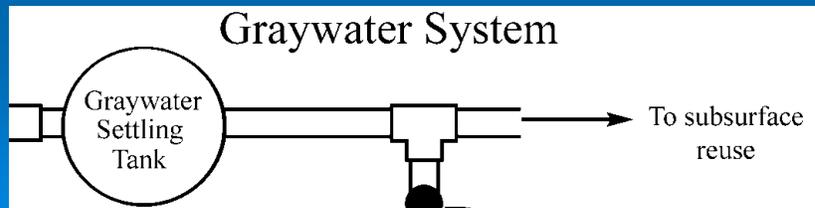
- Remember two loading rates
- Wastewater Quantity
 - Hydraulic load
- Wastewater Quality
 - Organic Load
- Evaluate technology

Sewage source removed from waste stream – enters gray water system	Flow (%)	BOD ₅ (mg/L)
Clothes washing machine	20	375
Showers, bathtubs, handwashing lavatories, and sinks that are not used for disposal of hazardous waste or toxic ingredients	30	430
Clothes washing machines showers, bathtubs, handwashing lavatories, and sinks that are not used for disposal of hazardous waste or toxic ingredients	50	600

30 TAC Chapter 285

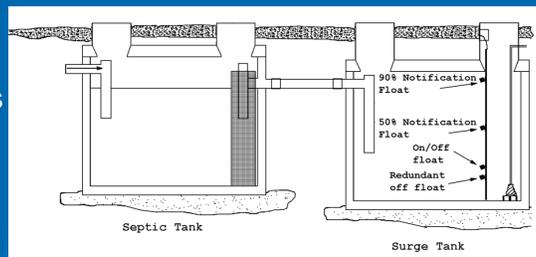
Components of Graywater System

- Wastewater treatment method
 - Trash tank
 - Other
- Overflow piping method
 - Backwater valves
 - Other
- Distribution method
 - Discharge hose
 - Drip distribution
 - Gravity drainfield
 - Low pressure distribution
 - Other



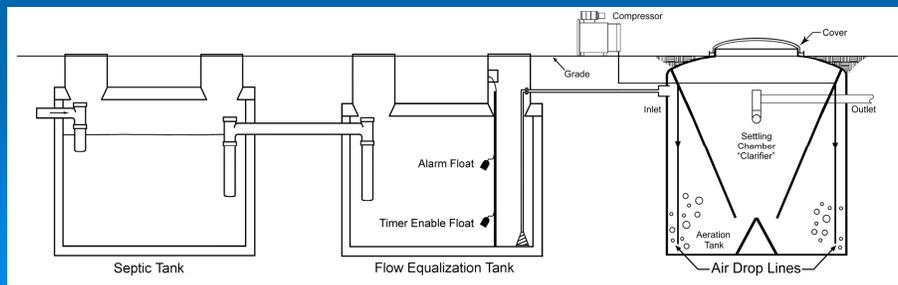
Flow equalization/surge tank concepts

- Moderate flow
 - Daily fluctuations
 - Weekly fluctuations
- Down stream components
 - Function more effectively
 - May allow decrease size



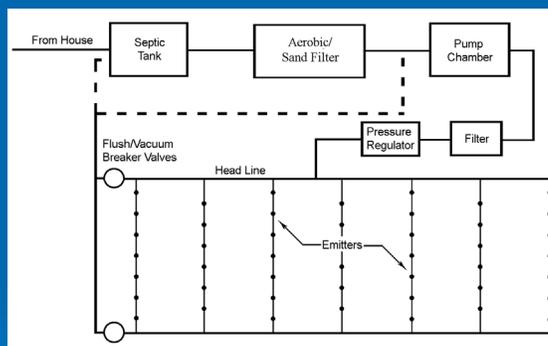
Incorporating flow equalization

- Modify the treatment train by adding components
- Add a flow equalization tank between the trash tank and aeration chamber
- Add pump with timer controls to dose treatment unit



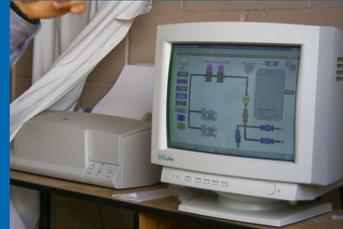
Drip Distribution Field Components

- Filtration
- Controller
- Water distribution devices (flow splitting)
- Supply line(s)
- Zones
- Supply manifold
- Drip laterals
- Return manifold
- Air relief/Vacuum breaker
- Return line



Control Systems

- Flow metering
- Control panels allow recording of critical data.
 - Elapsed time meter
 - Cycle Counter
- Computer monitoring allows evaluation of loadings to each zone and printing of daily reports.
- Remote monitoring / Telemetry



Drip Filter - Operation

- Filters in place
- Operating Pressure
 - Before filter
 - After filter
- Cleaning Method
 - Automatic cleaning
 - Cycle counter
 - Elapsed time meter
 - By-pass flow



Switching Valves - Operation

- Types of valves
 - Sequencing valves (also called hydraulic switching valves)
 - Solenoid
- Operating pressure
- Control of flow – make sure all zones receive effluent



Vacuum Breaker - Operation

- Opening and closing of vent
 - Limits risk of suction developing in lines
- Water exiting air relief valve
 - Bubbles are leaks



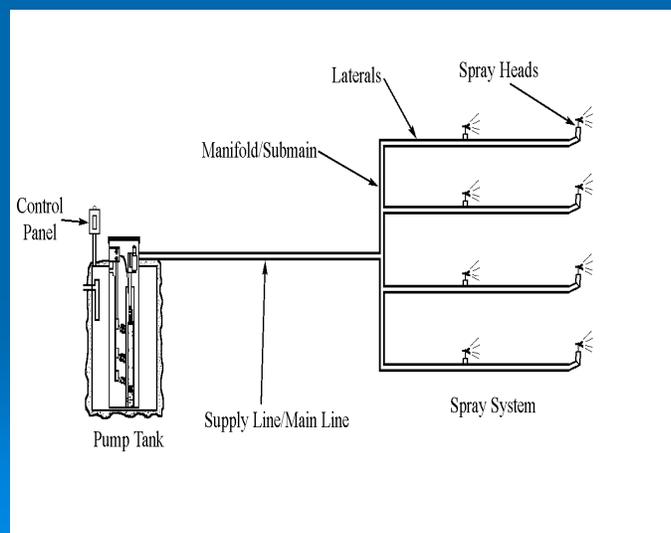
Field Flushing - Operation

- Type – Manual, Automatic, Continuous
- Conduct a flushing event
- Operating pressure during flushing
- Recording devices
 - Cycle counter
 - Elapsed time meter

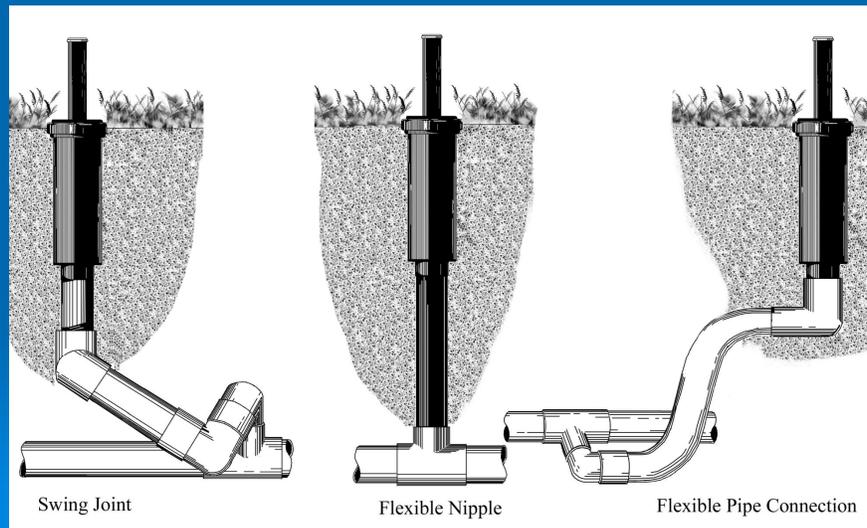


Spray Distribution Components

- Supply line
- Laterals
- Risers
- Distribution heads



Connecting Distribution Heads to Laterals



Spray System Water Quality



- High potential for human contact with water
- Secondary- Quality Effluent
- Remove 85-98% of solids and organic matter
- Remove pathogens
- Nutrients (nitrogen and phosphorus) are not required to be removed
- Soil for Final Treatment

Spray Distribution O&M



- Disinfection system
- Distribution approach
- Switching valves
- Purple Color Coding
- Operating pressure
- Control panel
- Distribution head operation
- Zone operation

Summary

- Water resources and the hydrologic cycle
- Site water management
- Rainwater Harvesting
- Indoor Water Reuse
- Graywater
- Drip distribution
- Spray distribution

References

- CIDWT. 2009. Installation of Wastewater Treatment Systems. Developed by Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT). Midwest Plan Service. Iowa State University. Ames, IA. December 2009.
- CIDWT. 2006. Residential Onsite Wastewater Treatment Systems: An Operation and Maintenance Service Provider Program. Developed by Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT). Midwest Plan Service. Iowa State University. Ames, IA. January 2006.