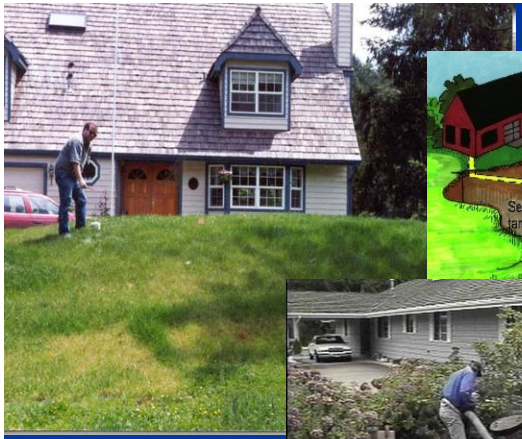

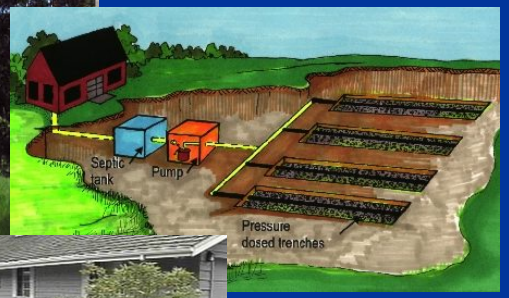

October 11, 2007
Reclaimed Water
Rule Advisory Committee

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On-site Sewage Systems
Part of Reclaimed Water Scene?

Our Discussion

- Objectives of on-site systems
- Conditions that maximize treatment
- Potential removal/treatment expectations
- How rule attempts to assure treatment
- Does this relate to reclaimed water?

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Management of Wastewater is a Major Challenge in the Puget Sound Basin

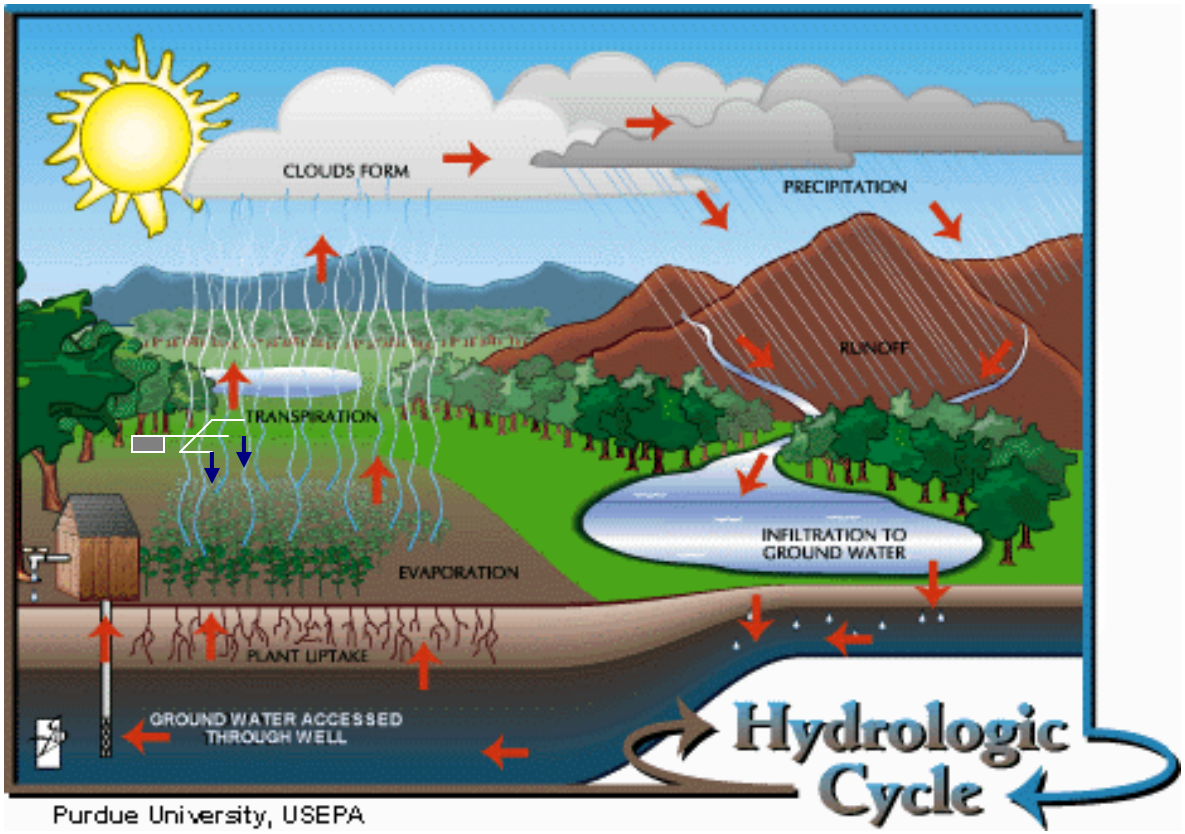
Issue	Sewers (discharge to surface water)	Septic Systems (discharge into soils)
Population Served (projected increase of 35% by 2025)	**2.85 Million (71%)**	**1.15 Million (29%)**
Total Volume	**400 Million GPD**	**175 Million GPD**
Groundwater Recharge	**Limited** (reclaimed water; upland spray)	**High** (but greater risk if failure)
Nitrogen Reduction	**10-40%[1]** (much more with tertiary treatment)	**10-40% Basic System[2]** (Much more with nitrogen removal)
Operation and Maintenance	**Daily**	**Limited** (Inspections required 1-3 years, but highly variable)
Water Quality Impacts		
– Shellfish Acres Permanently Closed	≈28,000 (excluding urban bays)	< 2,000 acres (where only source)
– Shellfish Area Closed/Outfall or Failure	Large areas (100s – 1,000s acres)	Small, localized areas (1-2 acres)
– Pipe breaks, Sewer Overflows, Failures	>1.3 billion gallons/year[3]	Variable depending on location
– Public Swimming Beach Closures	57 Short-term (2005 – 2006)	10 long-term (2005 – 2006)
SUMMARY	Both meet or exceed secondary treatment standards Both are capable of higher treatment Both create water quality challenges	

LOTT: ≈5% of 400 million GPD

[2] *Onsite Wastewater Systems Manual,* EPA/625/R-00/008, Table 3-17, 02/2002

[3] 2002 Ecology CSO Focus Sheet

OSS Fit Into Water Cycle



Purdue University, USEPA

They recharge aquifers…

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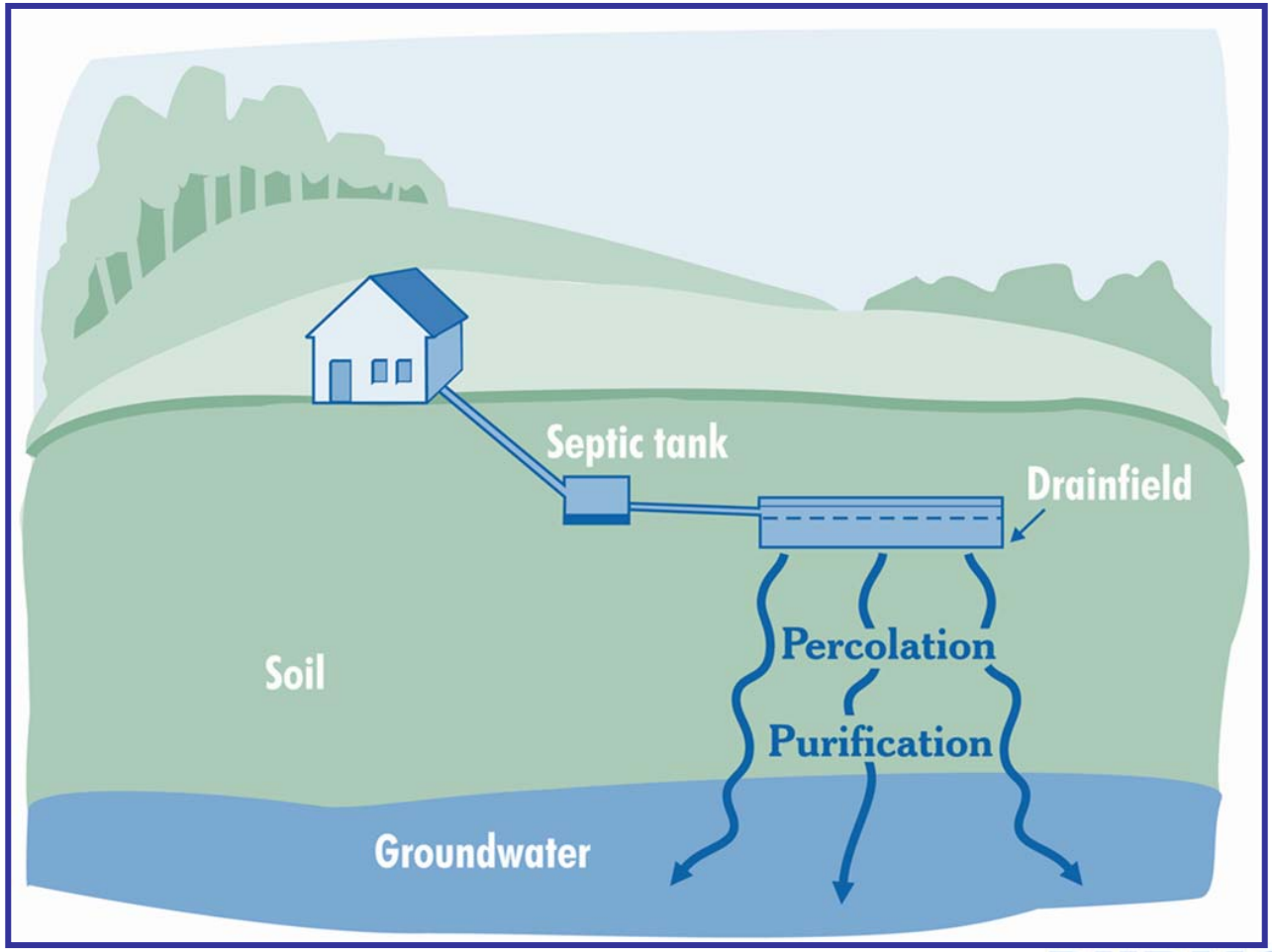
Typical Septic System (OSS)



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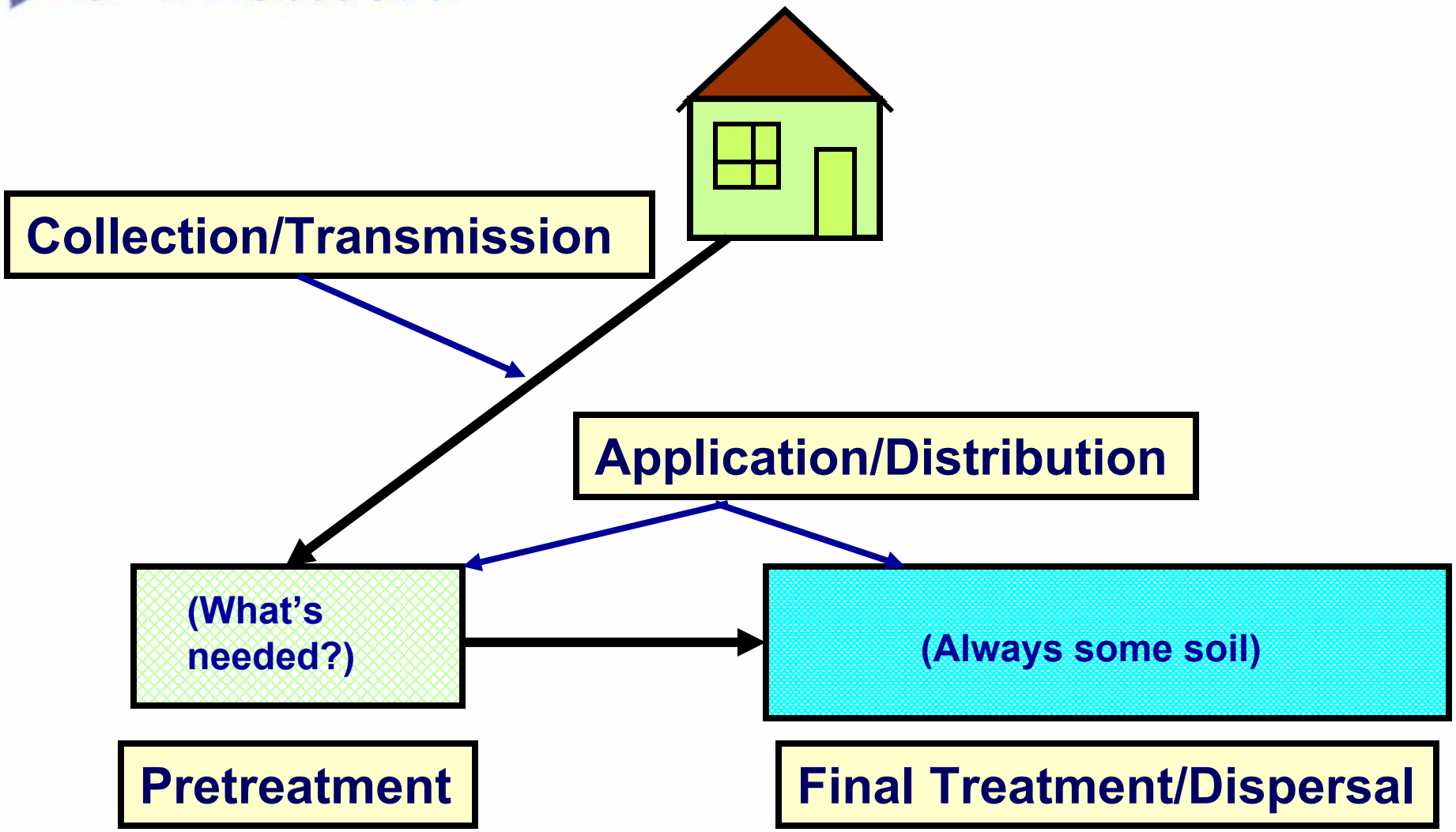
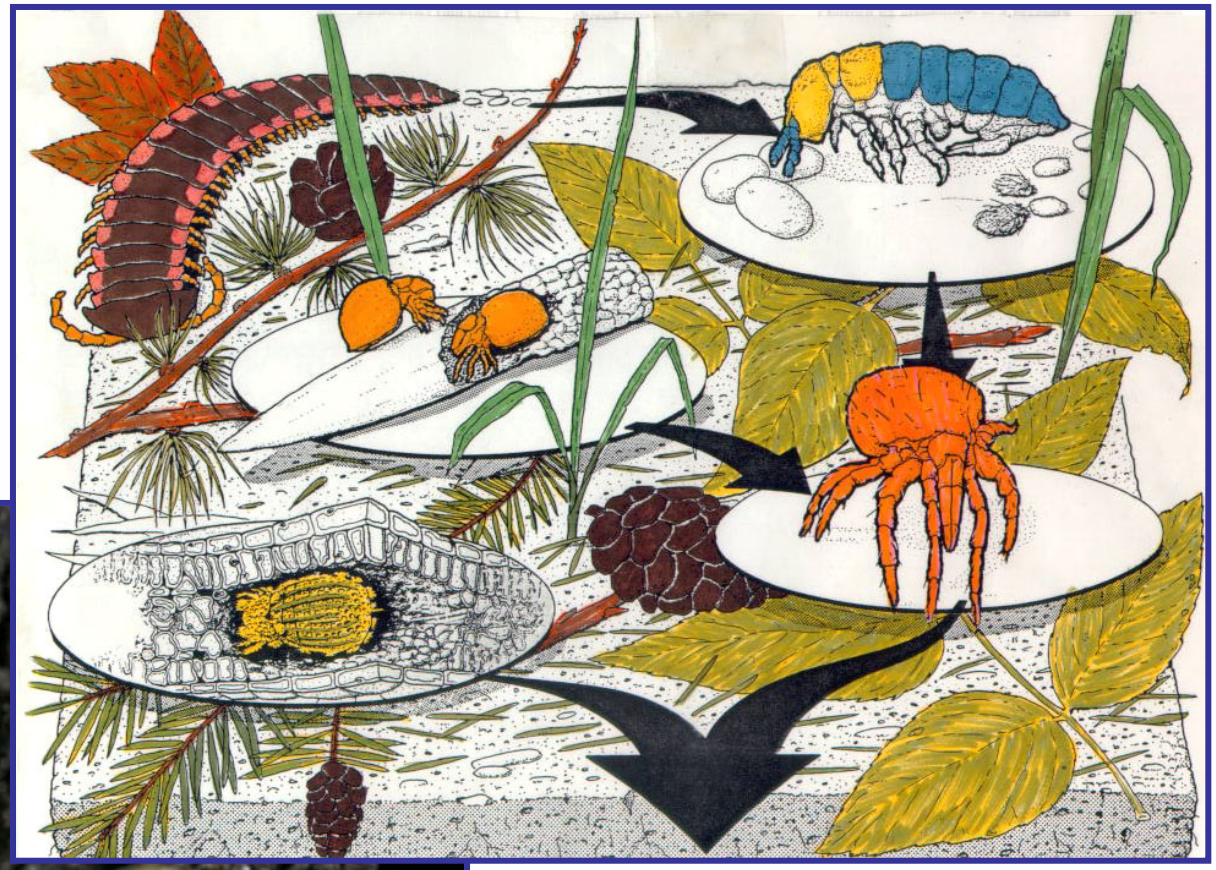
OSS System Components

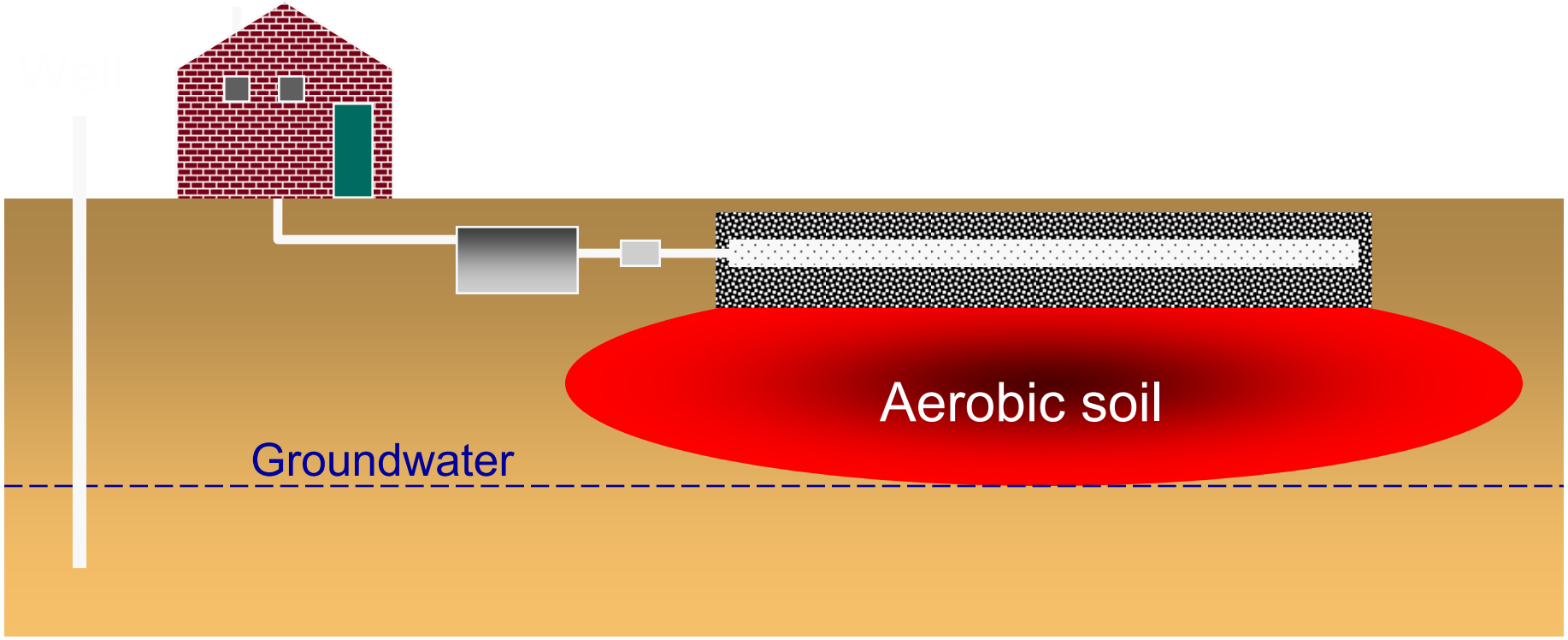


The soil ecosystem



Pathogen removal
Nutrient cycling
Organic decomposition

Aerobic Soil is Necessary



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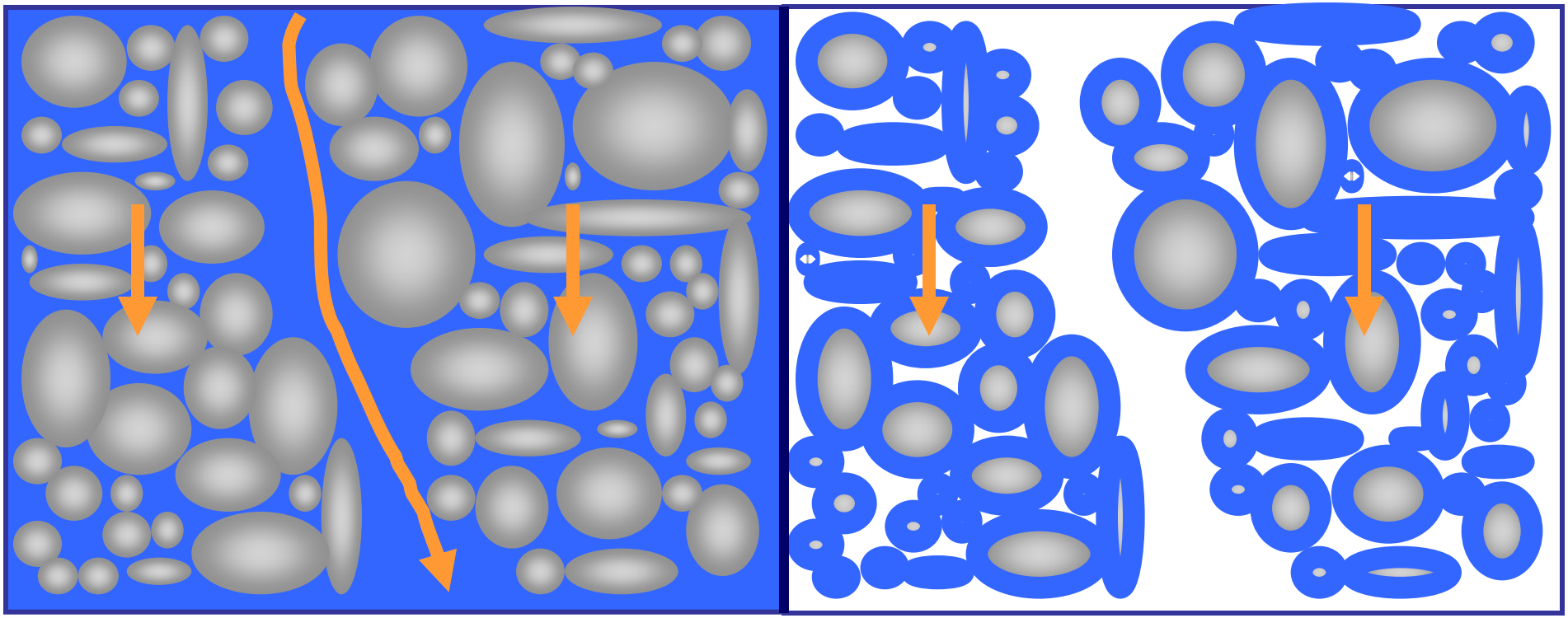
Unsaturated Flow Necessary

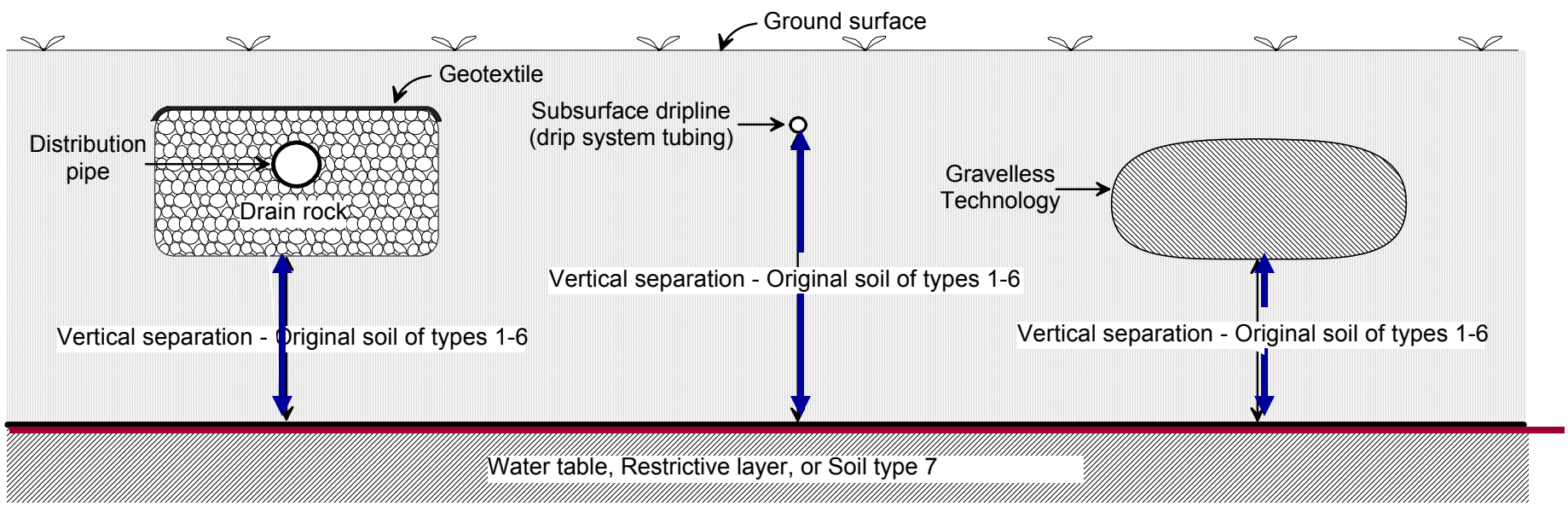


Majority of flow through macropores under saturated conditions

Majority of flow through intrapedal voids under unsaturated conditions

Achieved in rules by:

- Using conservative design flows
- Loading rates of 0.2 – 1.0 gal/ft^2/day
- Requiring specific ***vertical separation***



Achieved in rules by:

- Requiring a detailed site & soil assessment
  - Depth
  - Type (fine/coarse)
  - Water table?
  - Unconfined aquifer?
  - Proximity to surface water

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Allows Treatment Processes to Occur

- Variety of physical, chemical, and biological processes including:
  - Filtration
  - Predation
  - Aeration
  - Inactivation
  - Biological
  - Fixed film
  - Adsorption
  - Ion-exchange
  - Anaerobic zones
  - Disinfection
  - Physical/Chemical

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With proper soil conditions:

Parameter	Potential % Removal
BOD	>90
TSS	>90
Total N	10 – 20
Total P	85 – 95
Fecal Coliform	>99.99
Virus	>99.9
Heavy metals	>99
Organic chemicals	>99

Adapted from USEPA, 2002

But, what if improper soils?

Too Coarse

Too Shallow

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Various Treatment Levels

Level	Parameters				
	$CBOD_5$ (mg/L)	TSS (mg/L)	FOG (mg/L)	FC (#/100ml)	TN (mg/L)
A	10	10	---	200	---
B	15	15	---	1,000	---
C	25	30	---	50,000	---
D	25	30	---	---	---
E	200	80	20	---	---
N	---	---	---	---	20

To be met <u>prior</u> to discharge to soil

More Sensitive Sites – More Treatment Upfront

Vertical Separation	Soil Type ← Coarser ←		
	1	2	3 — 6
≥12” < 18”	A	B	B
≥18“ < 24”	B	B	B
≥24” < 36”	B	C	E
≥36” < 60”	B	E	E
≥60”	C	E	E

Pressure distribution with time-dosing

Pressure distribution

Gravity distribution

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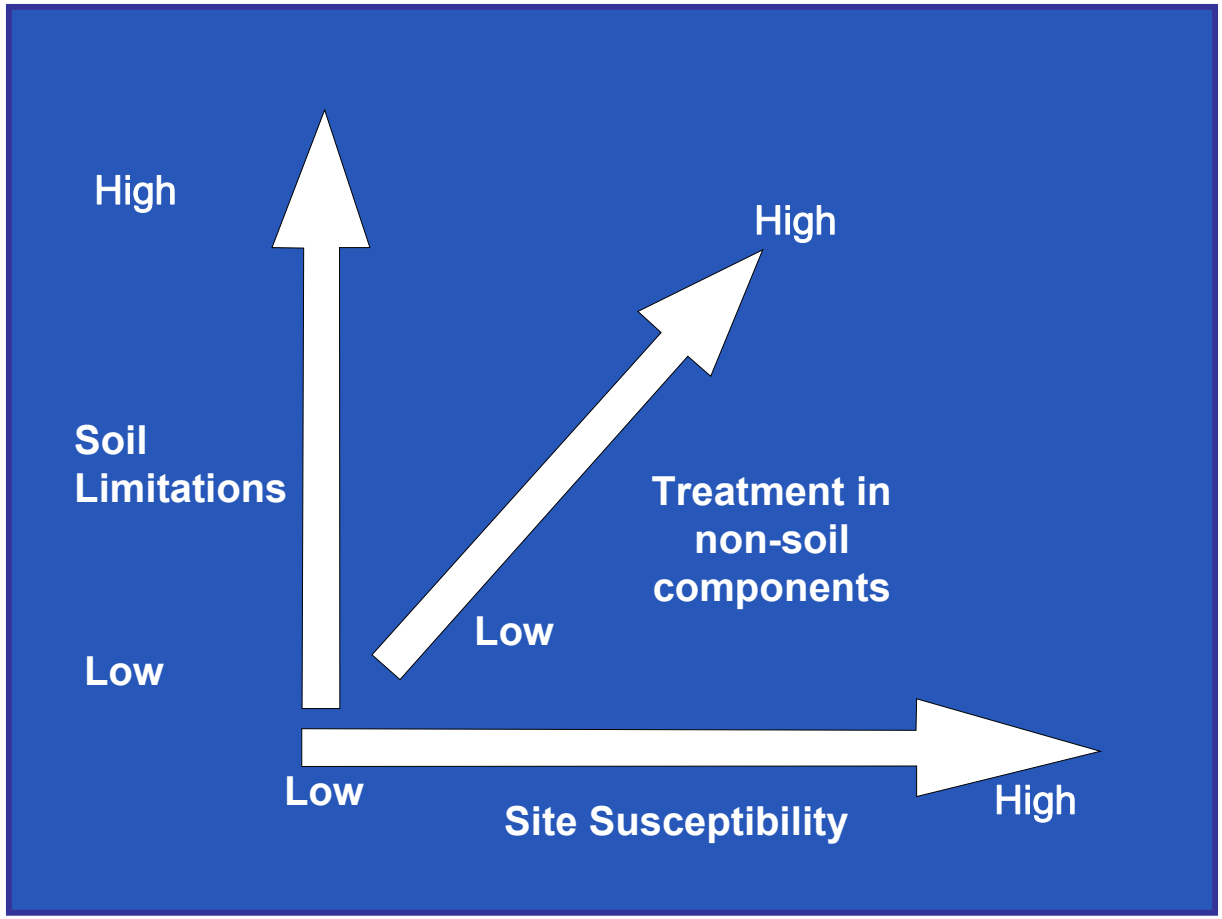
Need Good Design Decisions

- State licensed designer responsibility



Technology Review

- Verifying treatment capability of technology

Category 1: Product Name	**TL A**	**TL B**	**TL C**	**TL D**	**TL E**	**TL N**
AdvanTex AX20			✓	✓		
AdvanTex AX20 with Salcor	✓	✓				
Glendon Biofilter M3 & M31	✓	✓	✓	✓	✓	
RetroFAST 0.375					✓	✓
SeptiTech M400D, M550D					✓	✓
MicroFAST with Salcor	✓	✓				
Intermittent Sand Filter		✓	✓	✓		
Sand-Lined Trench		✓	✓	✓		
Stratified Sand Filter	✓	✓	✓	✓		

Decisions to be made:

- E.G., if nitrogen to be reduced/removed

Remove it

- **Blackwater toilet**
- **Treatment Level N**
- **Subsurface drip**

↔

Dilute it

(Minimum land area)

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Failing Systems

- Must be repaired

Vertical Separation (inches)	Horizontal Separation (feet)											
	< 25			≥ 25 to < 50			≥ 50 to < 100			≥ 100		
	Soil Type			Soil Type			Soil Type			Soil Type		
	1	*2*	*3-6*	*1*	*2*	*3-6*	*1*	*2*	*3-6*	*1*	*2*	*3-6*
< 12	A	A	A	A	A	A	A	A	B	B	B	B
≥ 12 to < 18	A	A	A	A	B	B	A	B	B	Conforming Systems		
≥ 18 to < 24	A	A	A	A	B	B	A	B	C			
≥ 24 to < 36	A	B	B	B	C	C	B	C	C			
≥ 36	A	B	B	B	C	C	B	C	E			

Need Proper Use & Care

- On-going monitoring/maintenance
  - Has <u>not</u> been done in most cases
  - Considerable work/effort still needed

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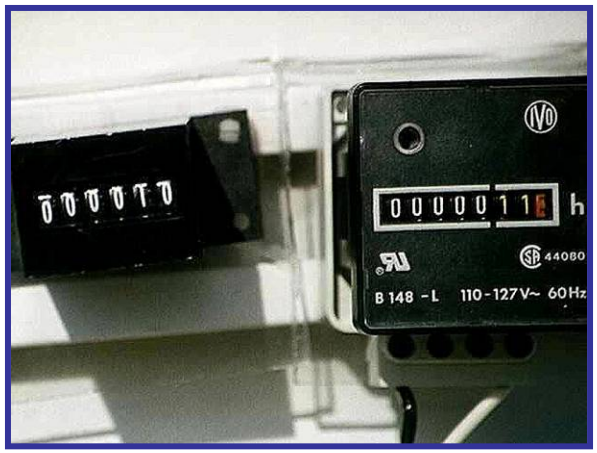
New Rule Helps:

- Requires all components to be accessible
- Requires pump systems to measure flows
- System owner required to evaluate



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Large On-site Sewage Systems

- DOH requirements in 2007 Legislation
  - Approval for 3,500 – 100,000 gpd that go <u>into</u> soil
  - Protect both public health & environment
  - Meet Chapter 90.48 RCW
  - All LOSS under permit by 7/1/2009
  - Certified operator program

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Do “septic systems” deserve their bad reputation?

- Yes
  - Many old ones – disposal only
  - Many unknown ones, unknown failures
  - Haven’t been used/cared for properly
  - Expections not consistent with potential use
- But, with proper quality control
  - Whatever treatment needed can be provided
  - Can provide needed options to communities
  - Users must realize – not as convenient as sewers

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Questions

- Do OSS/LOSS recharge aquifers?
- If yes, what should their relationship to reclaimed water be?
- How different/similar should technical standards be?
- How do we assure on-going O&M?

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Washington State Department of Health

Questions?

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