

Design and Management Issues
Distributed Wastewater Systems to Protect Public Health
and Environmental Quality
EPA Webinar
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And
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USEPA Decentralized Program Strategy

Vision:

Decentralized wastewater systems are appropriately managed, perform effectively, and are widely acknowledged as components of our nations' wastewater infrastructure.

Mission:

EPA will serve as a catalyst for improving system performance through partnering to upgrade professional standards of practice and institutionalize the concept of perpetual management.

Albany, March 31, 2000 – State Health Commissioner Antonia C. Novello, M.D., M.P.H. today released the final report detailing results of the New York State Department of Health's investigation into the 1999 *E. coli* 0157:H7 outbreak associated with attendance at the Washington County Fair. The findings indicate that the outbreak **may** have resulted from contamination of the Fair's Well 6 by a dormitory septic system on the fairgrounds, although manure runoff from the nearby Youth Cattle Barn cannot be ruled out as a possible contamination source

STUDIES

GROUNDWATER STUDIES

- Boundary conditions?
- Cogger and Sobsey (1993)
 - Virus indicators, coastal sands
- Otis and Anderson (2000)
 - Various indicators, Florida sands
- Many Others – attenuation with distance from source
- DETECTION IS NOT HAZARD

EPIDEMIOLOGY STUDIES

- Borchardt, M.A., et al. 2010, NGWA.ORG, Groundwater.
- Door County; poor soil, inappropriate design, improper well development: result-
Norovirus outbreak at restaurant. Patrons and employees sickened
- DETECTION WAS HAZARD

Issues

- USEPA and state programs
- Planning Issues from Distributed Wastewater Perspective
- Sound science and engineering
- Management Approaches to protect:
 - Public health
 - Environmental quality
 - Community aesthetic

Functions of Onsite Systems

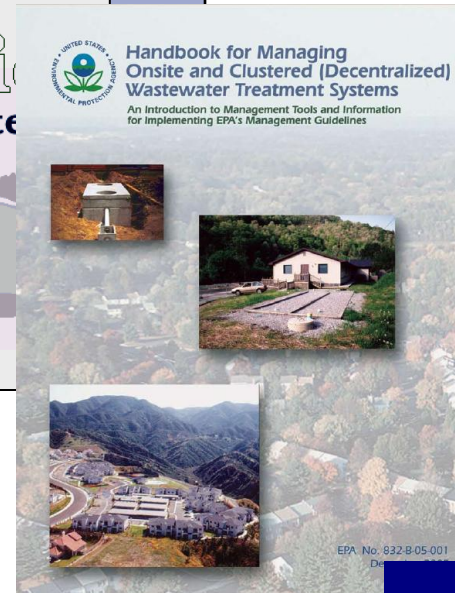
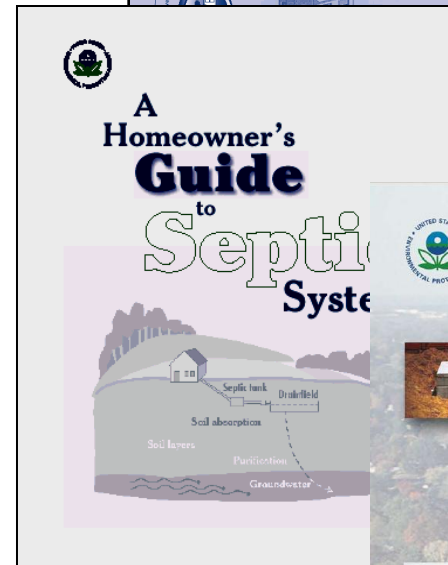
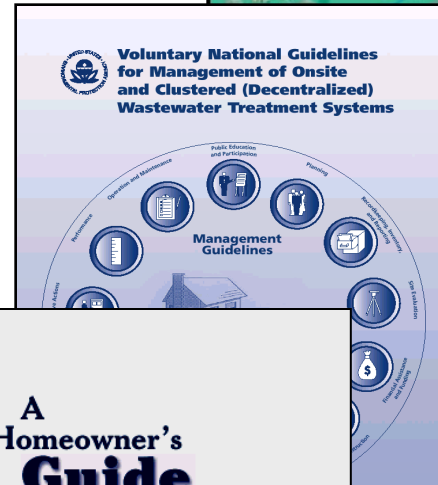
- Hydraulic – accept and transmit liquid
- Process – accept and attenuate constituents
- Proper design and management essential
 - Soil treatment necessary
 - Where soil presents limitation
 - Alternative design
 - Pretreatment
 - MANAGEMENT necessary for risk reduction

System dysfunction attributed to

- Poor site selection and assessment
 - Inadequate separation to limiting condition
- Improper design
 - Inadequate capacity causing surfacing effluent or untreated discharge to groundwater
- Improper installation, operation and maintenance
 - Infiltration and hydraulic overload
 - Leakage of untreated effluent from components

US EPA resources at www.epa.gov/owm/septic

- Design guidance
- Management guidelines
- Case studies
- Technology fact sheets
- State and local examples
- Research, demonstration projects, and other tools

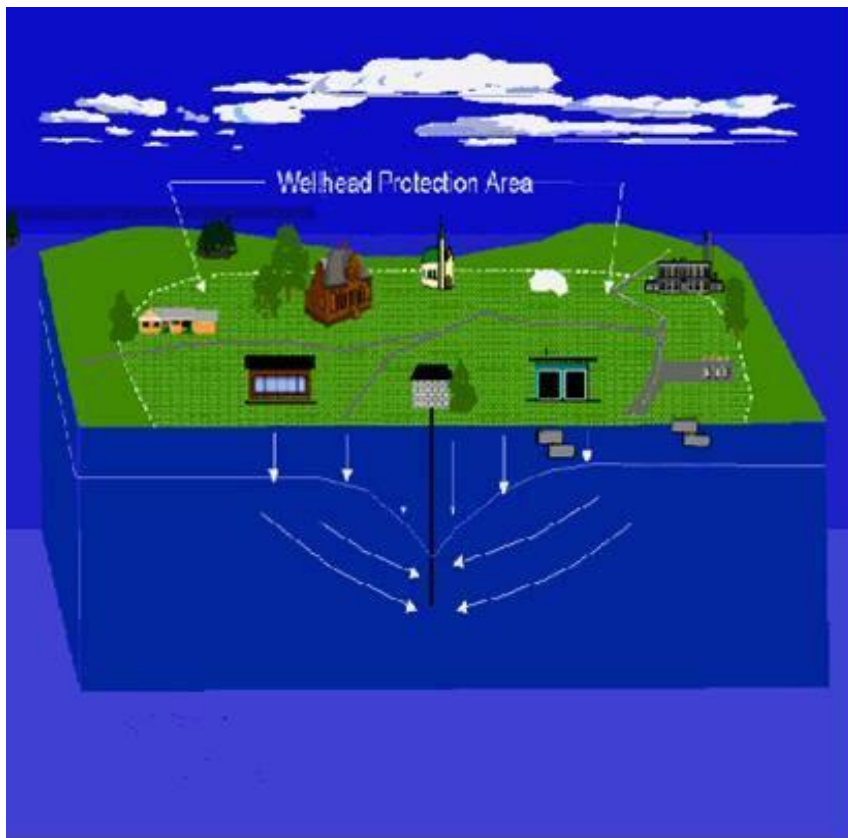


Program Elements

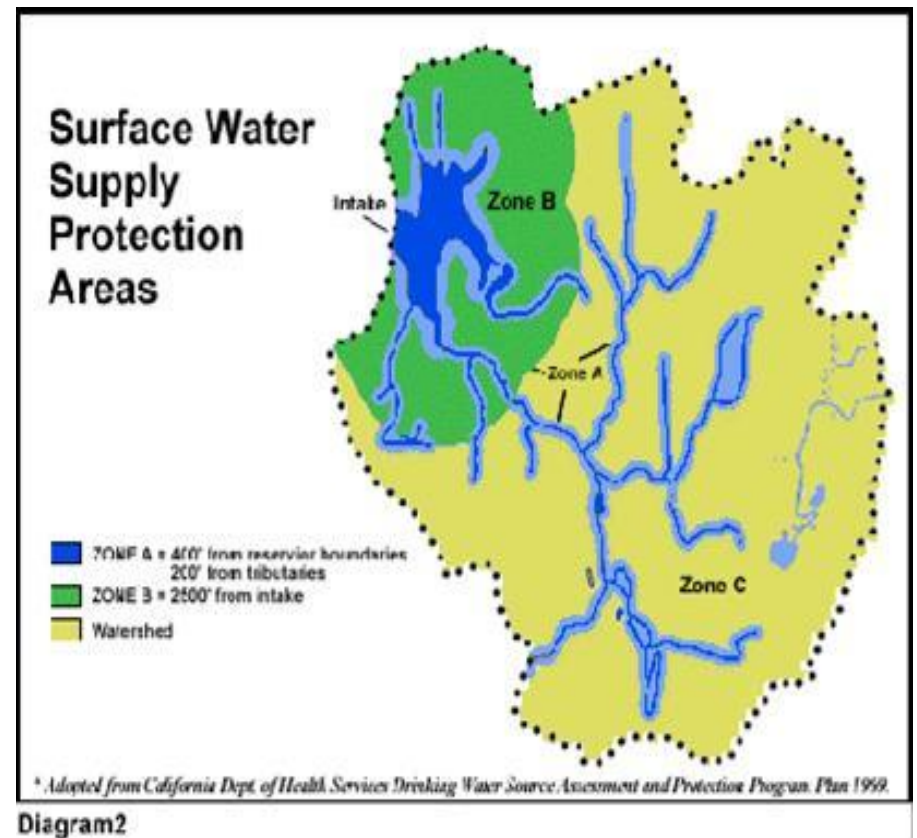
- Public Participation
- Planning
- Performance
- Site Evaluation
- Design and permitting
- Construction
- Sound O and M
- Residuals Management
- Certification and licensing
- Education and training
- Inspection and monitoring
- Corrective action
- Records and reports
- Financial assistance

Consider source water protection areas when establishing wastewater program requirements

Ground Water



Surface Water



Science based technology incorporated into Rule

- USEPA Design Manual for Onsite Systems
- Soil integral part of treatment process
- State rules - i.e.
 - 15 A NCAC 02U, Reclaimed water standard – DWQ applied to onsite reuse
 - 18 A NCAC Ch 18, Sub-Ch 18, 0.1900 – DEH
 - Sizing, siting, design, operation, management criteria
 - Risk management strategy incorporated into rule
 - Separation distance
 - Loading rates

Site and Soil Factors Determine Treatment Potential

- Site:
 - Slope
 - Landscape position
 - Drainage features
 - Boundaries
 - Hydraulic
 - Property
- Soil:
 - Depth
 - Color
 - Texture
 - Structure
 - Consistence

Slope Positions



Summit

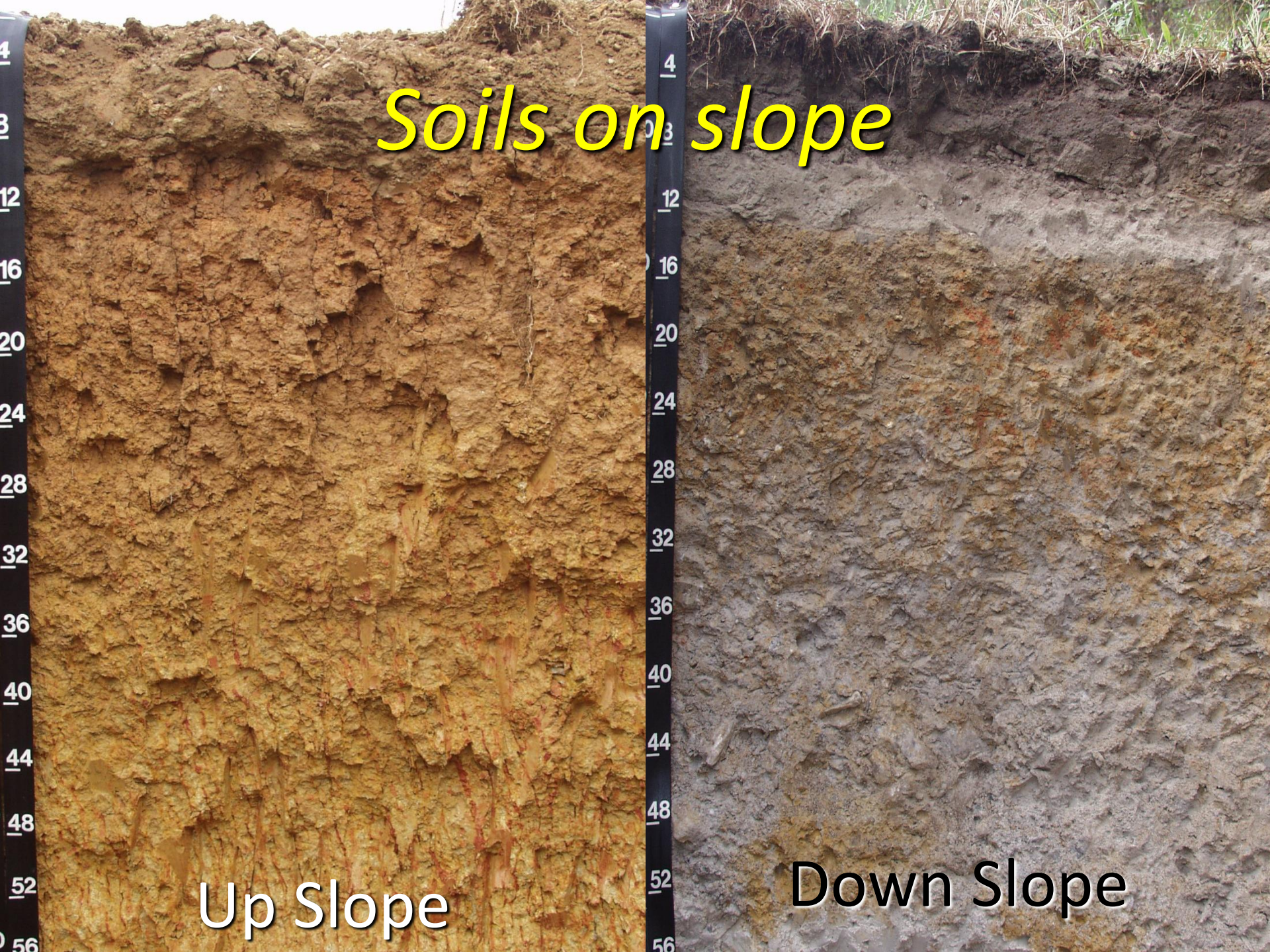
Shoulder

Side or back slope

Foot slope

Toe slope

Soils on slope



Up Slope

Down Slope

Site and soil assessment

- Limiting constituent
 - Hydraulic
 - Nutrient
 - Depth
 - Boundaries
 - Property
 - Hydrologic
- Appropriate design
 - Conservation/treatment
 - Treatment
 - Treatment
 - Treatment

Wastewater treatment and dispersal

- Simple septic tank
- Aerobic or aeration for advanced treatment
 - Fixed media
 - Suspended medic
- Disinfection
- Standards
 - NC DHHS TS 1 or 2
 - NSF/ANSI 40 or 350
- Soil based
 - Surface
 - Spray/drip/recharge
 - Sub-surface
 - Deep
 - Shallow
 - Drip

Advanced Wastewater Treatment

Processes

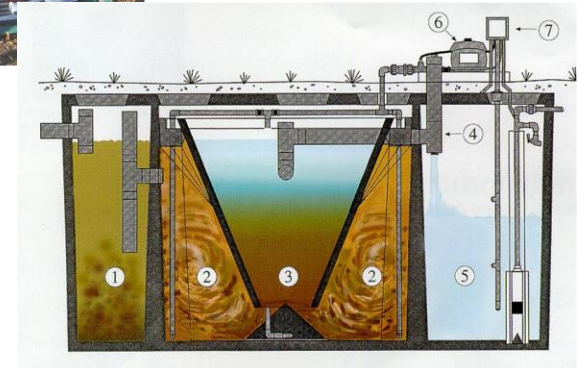
- Process capabilities (BOD, TSS, Nutrients, biologicals)
 - NSF
 - State Rules

Pretreatment



Fixed Media

Parameter	BOD	TSS	Coliform
TS1	15 mg/l	15 mg/l	10000
TS2	10 mg/l	10 mg/l	1000
Reuse	5 mg/l	5 mg/l	14



Suspended media

Dispersal Alternatives

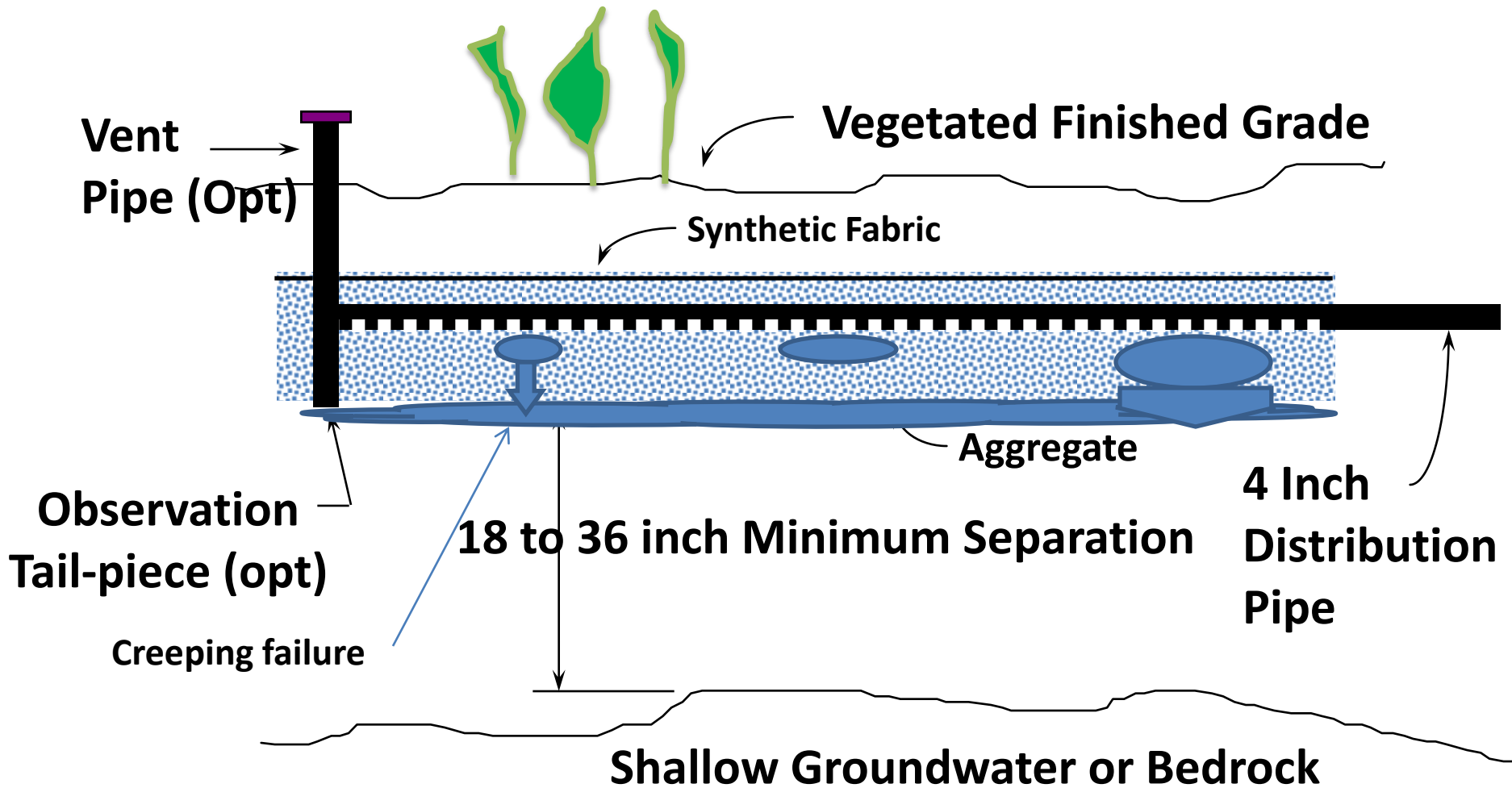
Conventional

- Typically gravity induced
 - 3-4 feet soil required
 - Prescriptive soil properties

Alternative

- Typically pump dosed
 - Shallow placement possible
 - Performance standards may be imposed
 - Monitoring

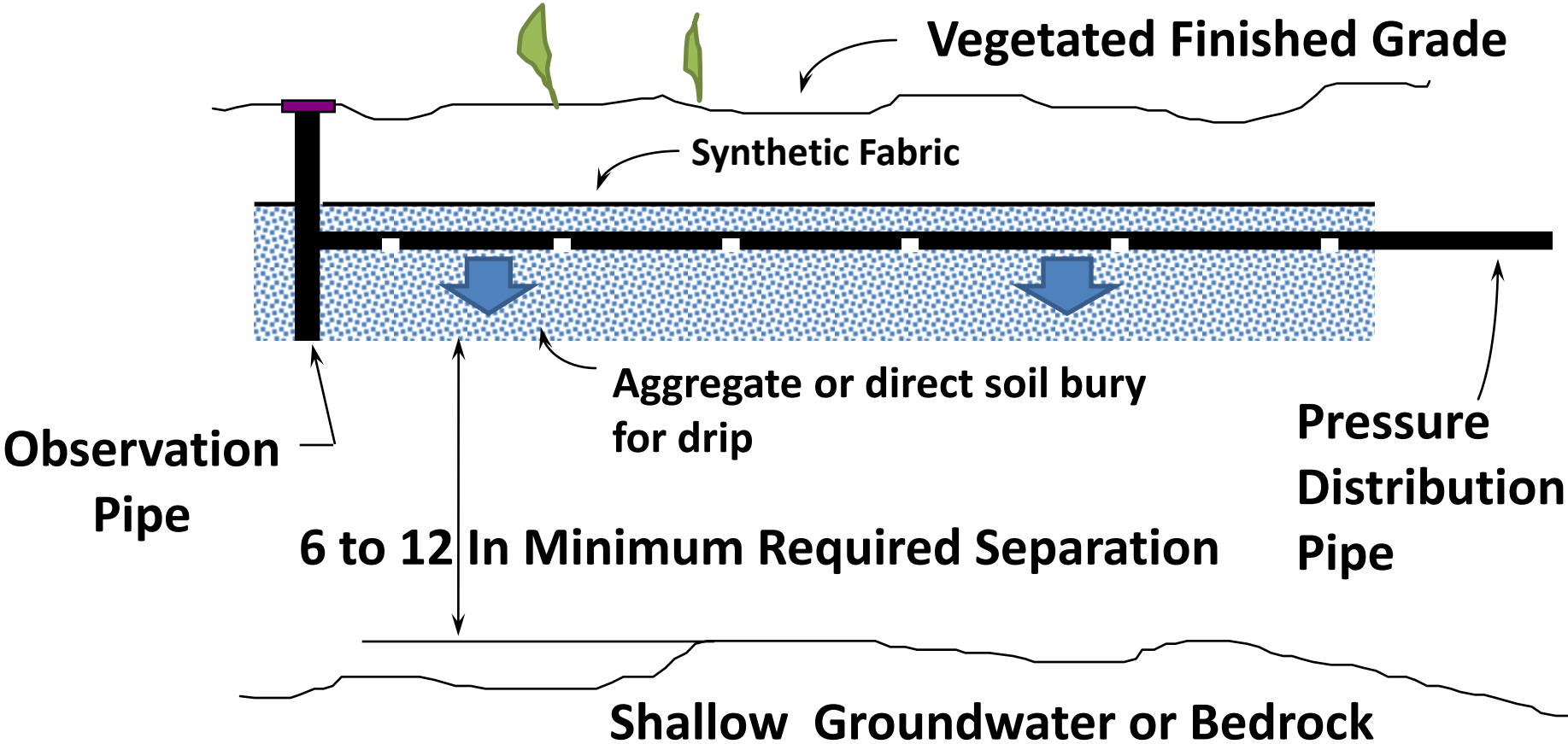
Gravity 4" Pipe System



Pressure Dosed

- LPD
 - Follow contours
 - 18 x 18 (typ) trench
 - 65 foot (Max) run with 1.25" PVC
 - Orifice protection recommended
 - Drill perforations
 - Spacing variable
- Drip
 - Follow contours
 - Direct burial
 - 300 – 400 ft max run
 - No orifice protection required
 - Engineered orifice
 - Pressure compensating or non-pressure compensating
 - Set spacing

Pressure Pipe or Drip System



Next Step – Onsite Reuse

- Highest level of protection mandated
- NSF 350 Standard
- State Standards
 - California Title 22
 - Virginia (9 VAC 25-740)
 - North Carolina (15 A NCAC 0.2U or .1900)
 - Many others

Solaire, Battery Park, Manhattan, NYC



- Decentralized reuse in highly urbanized area
- LEED Platinum
- Green roof filters and captures stormwater
- Wastewater and stormwater treated for reuse
 - Toilet flushing
 - Cooling tower supply
 - Irrigation of park
- 48% reduction in potable water consumption
- 56% reduction in wastewater discharge

Reference – Battery Park City Authority Manhattan Borough, NYC, The Solaire – Alliance Environmental, LLC

LEED Gold in NC

High School

25000 GPD

Indoor use (toilet flush)

Outdoor use (irrigation)

Constructed wetland and UV



City Park

1500 GPD

Indoor use (toilet flush)

Onsite MBR, UV and CI



System Management

- Treatment Component
- Dispersal Component
- Management entity
 - Operators
 - Owners
 - Onsite infrastructure
- Regulatory Component

Resources

- USEPA, 2004 Reuse Guidelines, 625R-04-108
- WEF MOP 16 Natural Systems
- WERF Decentralized Systems
- NSF standards
- State rules and regulations

Conclusions - Design and Operate to Reduce Risk

- Wastewater characteristics and treatment
- Site and soil conditions and limitations
- Performance based designs to address site and soil limitations
- Management vital

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