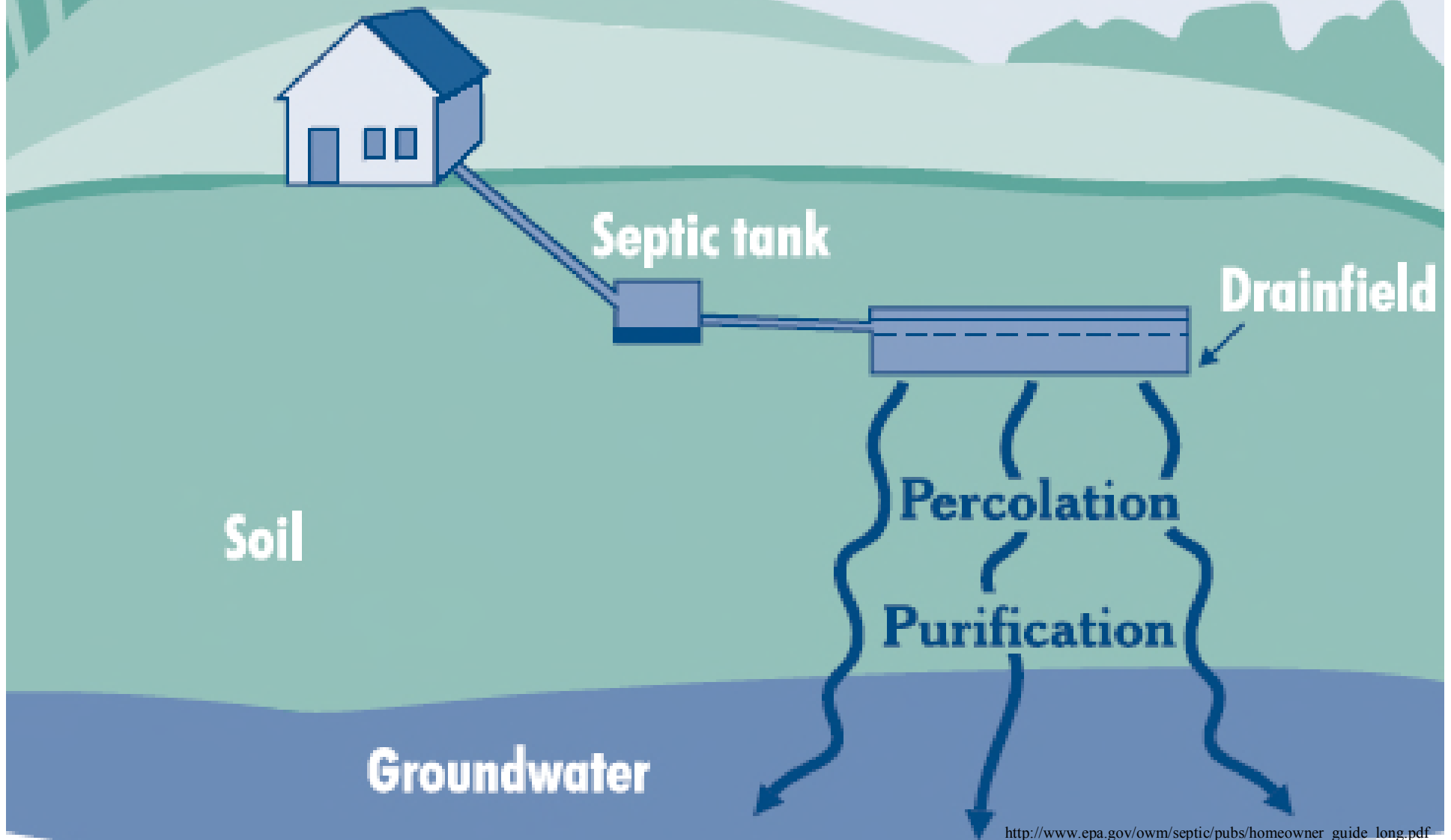


Septic Systems: Form and Function

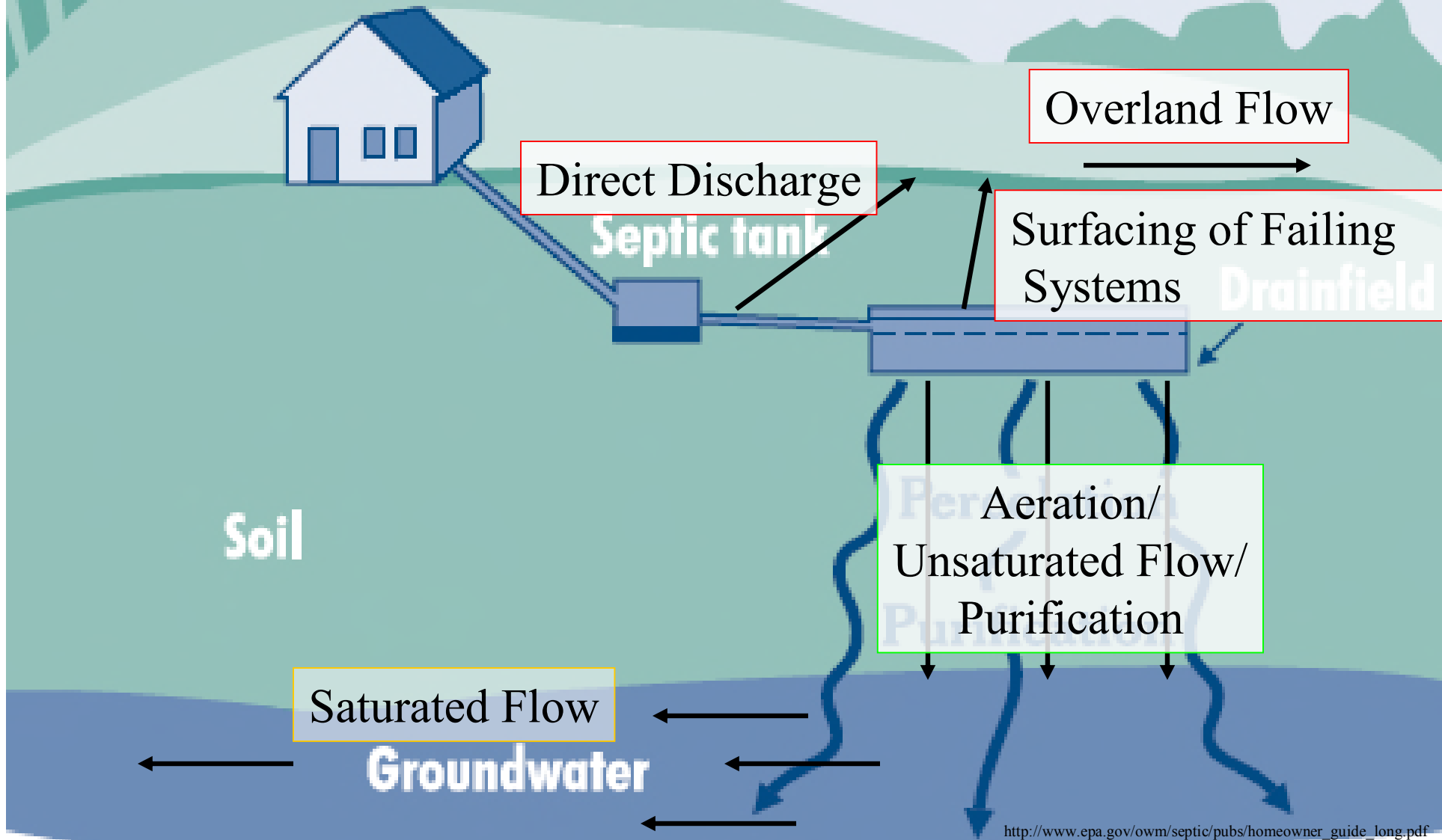
Wakulla Springs Workshop
February 25, 2009

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What is a standard septic system?

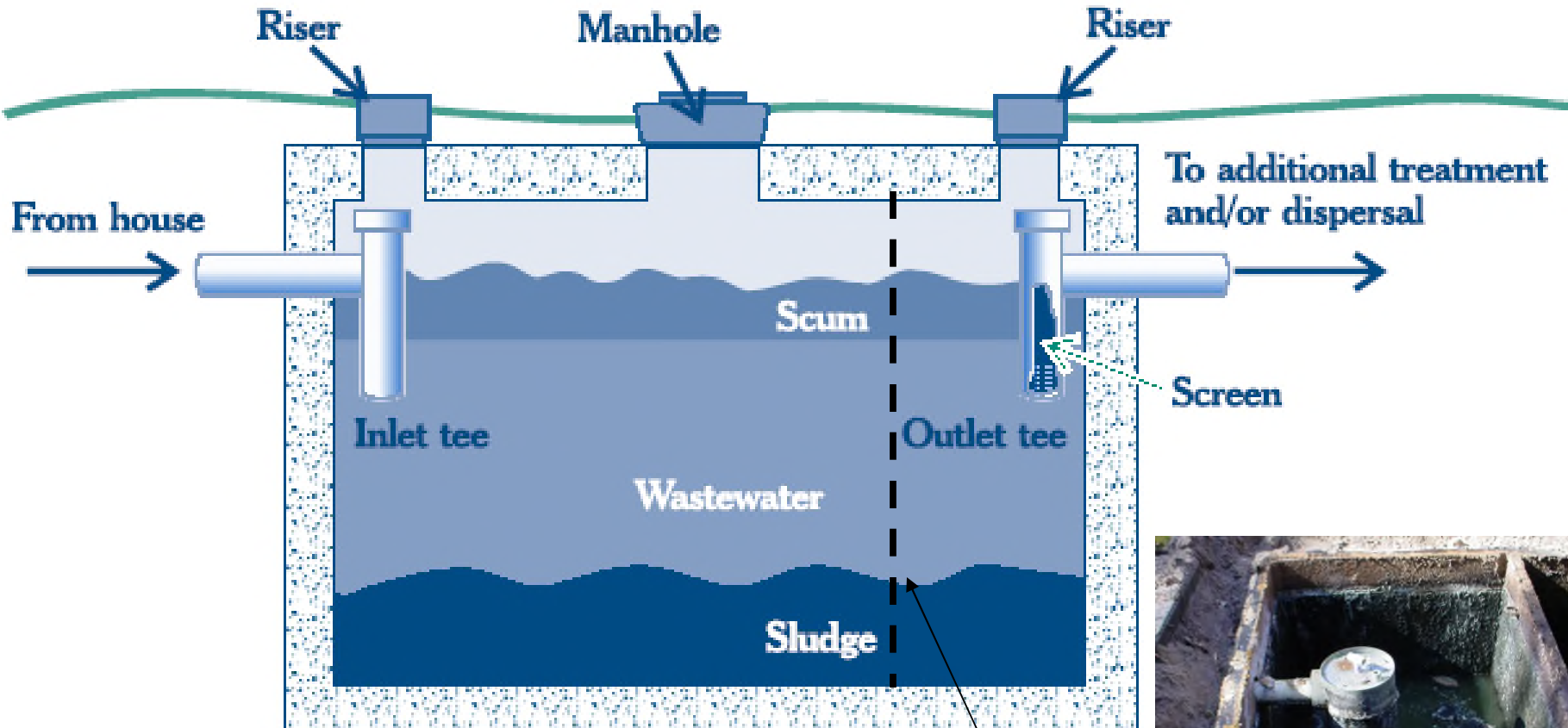


Functions and Malfunctions of Septic Systems





First Stop: Septic tank



Compartment Wall

http://www.epa.gov/owm/septic/pubs/homeowner_guide_long.pdf

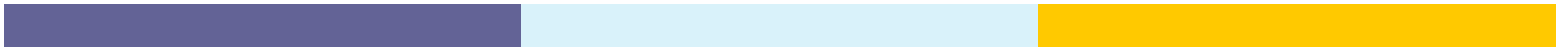




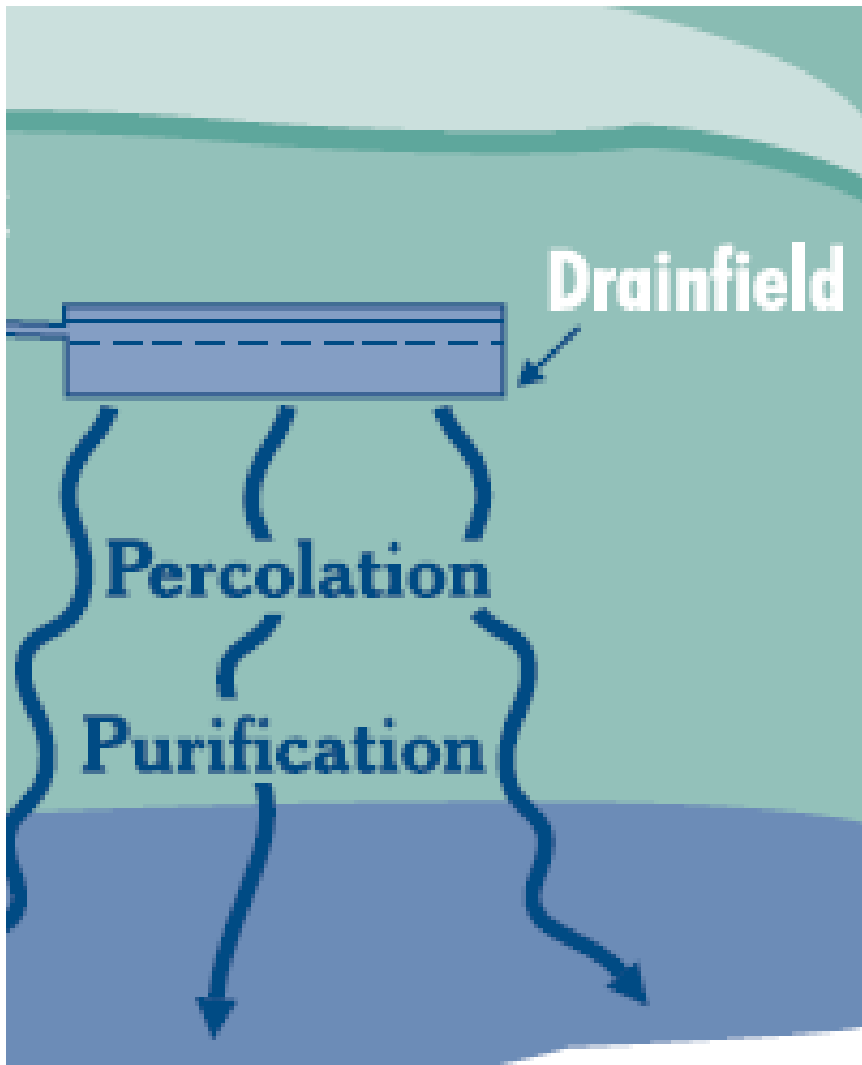
Functions of the septic tank

- Collects solids (80% TSS reduction Lowe et al. 2007)
 - > must be pumped regularly (e.g. 3-5 years)
- Removes a third to half of food (BOD5) without oxygen
- little if any Nitrogen removal
(11+/- 5 lbs of total nitrogen per person and year leave tank)
- Watertight





Next stop: Drainfield



6" minimum between top of drainfield and ground surface required

thickness of drainfield (12" for gravel)

2 feet between bottom of drainfield and seasonal high water table required since 1983



Functions of the drainfield

- Stores peak flows
- Disposes of water
- Consumes food using oxygen (air in soil)
- Removes/filters germs, food, suspended solids in the unsaturated zone
- Converts nitrogen to nitrate





Keeping the Drainfield up: The “Mound”

- Alternative drainfield that allows separation of drainfield from groundwater





How to take care of a system?

- Three P's
 - Pump: have your system inspected and pumped by a licensed septage disposal company every 3-5 years
 - Protect (know where your system is):
 - never drive or park over your system
 - Plant only grass or similar on drainfield to avoid damage from roots
 - Divert gutter downspouts away from drainfield
 - Prevent:
 - Use the toilet only for human waste
 - Do not pour toxic products (medicines, cleaners, paints) down the drain
 - Fix leaky toilets, don't waste water
 - Spread out laundry load
 - Use compost instead of garbage disposal





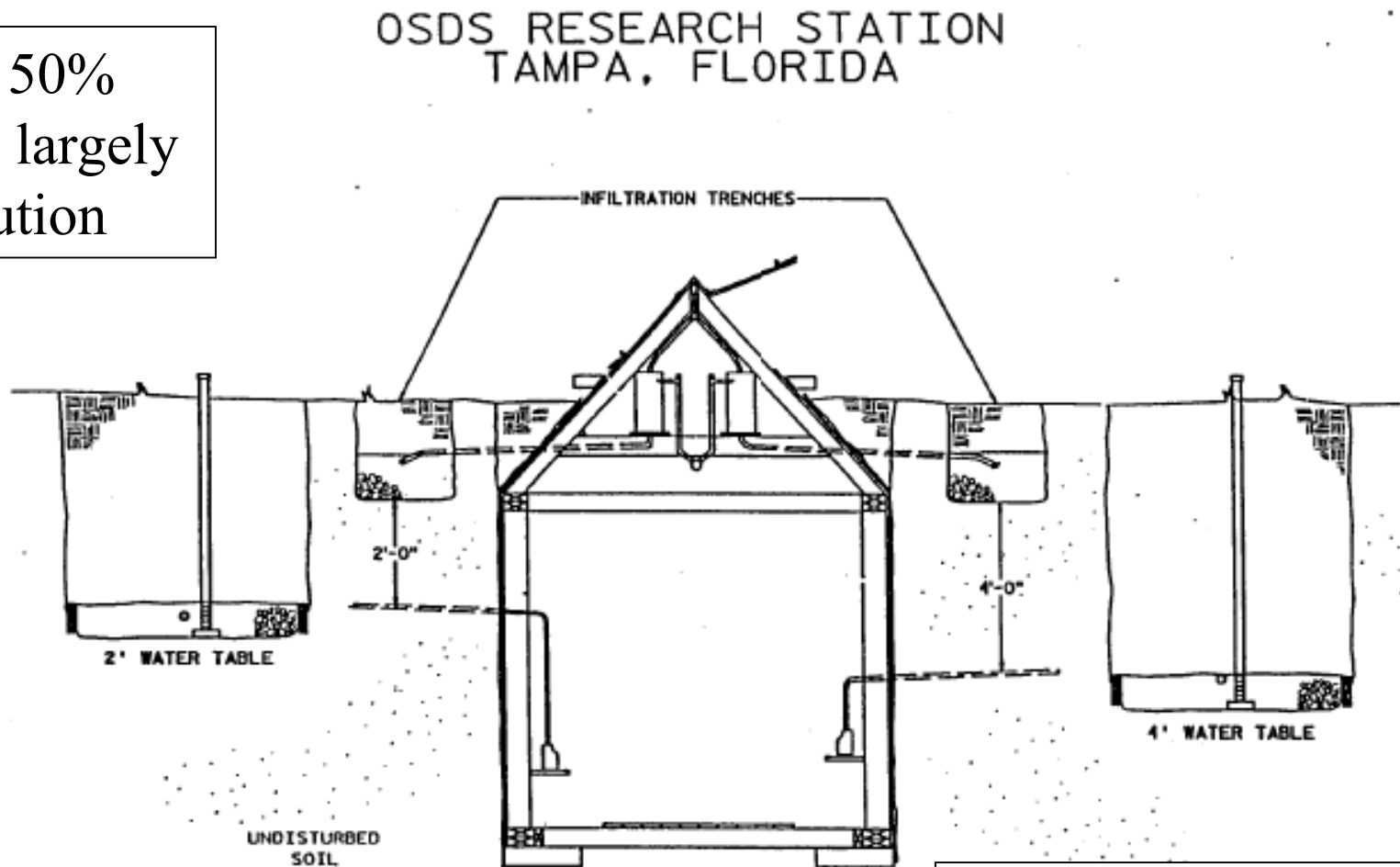
Factors that influence nitrogen transport to and in ground water (Otis, 2007)

- Good conditions for denitrification (=removal of nitrogen):
 - Nitrogen present as nitrate after contact with air
 - Denitrification requires absence of air
 - Poorly drained
 - water table no deeper than 3.5-feet below grade
 - high organic carbon in the soil below drainfield (>1%)



Unsaturated Soil

TN: up to 50%
reduction, largely
due to dilution



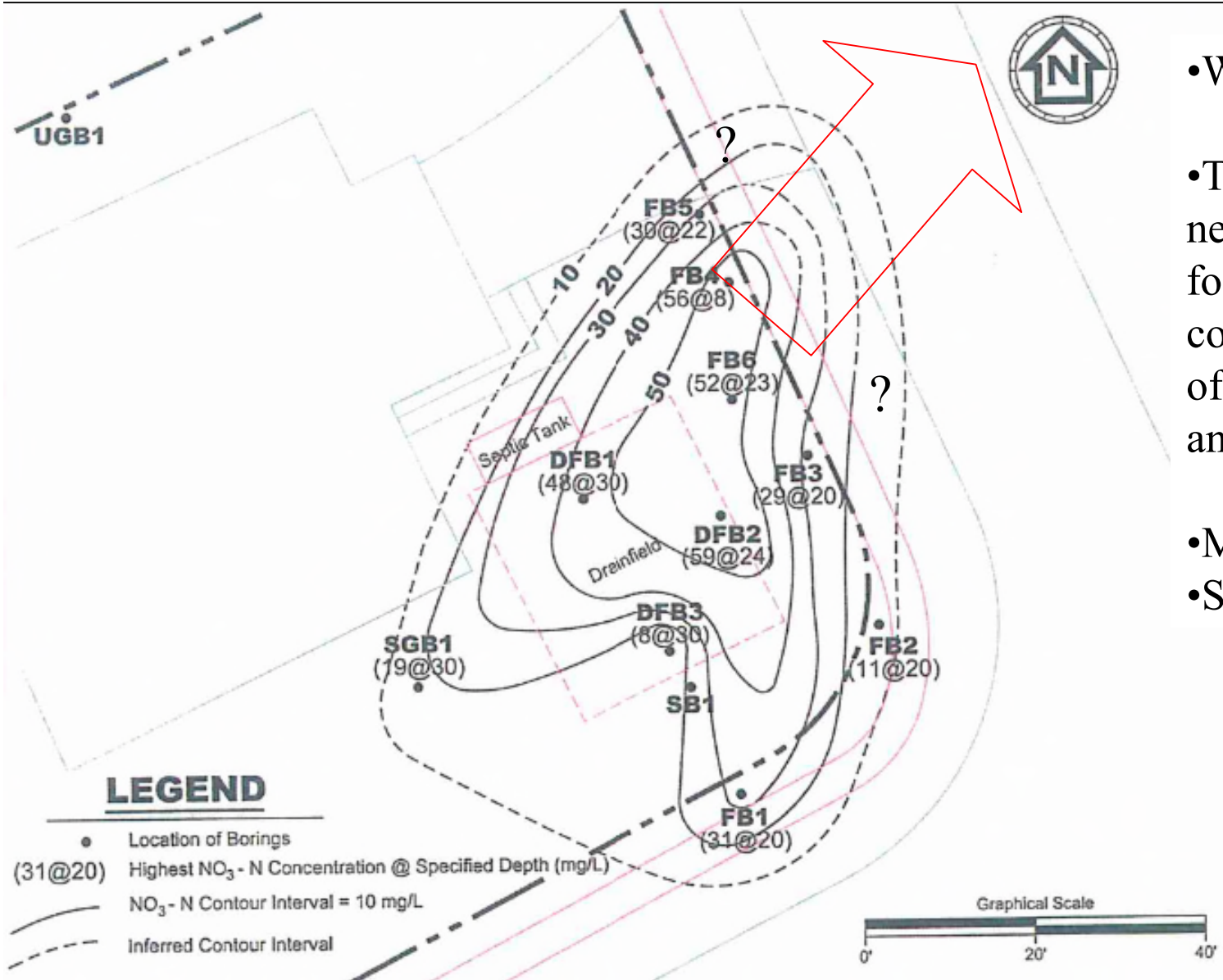
Candler fine sand

AYRES
ASSOCIATES

SECTIONAL VIEW



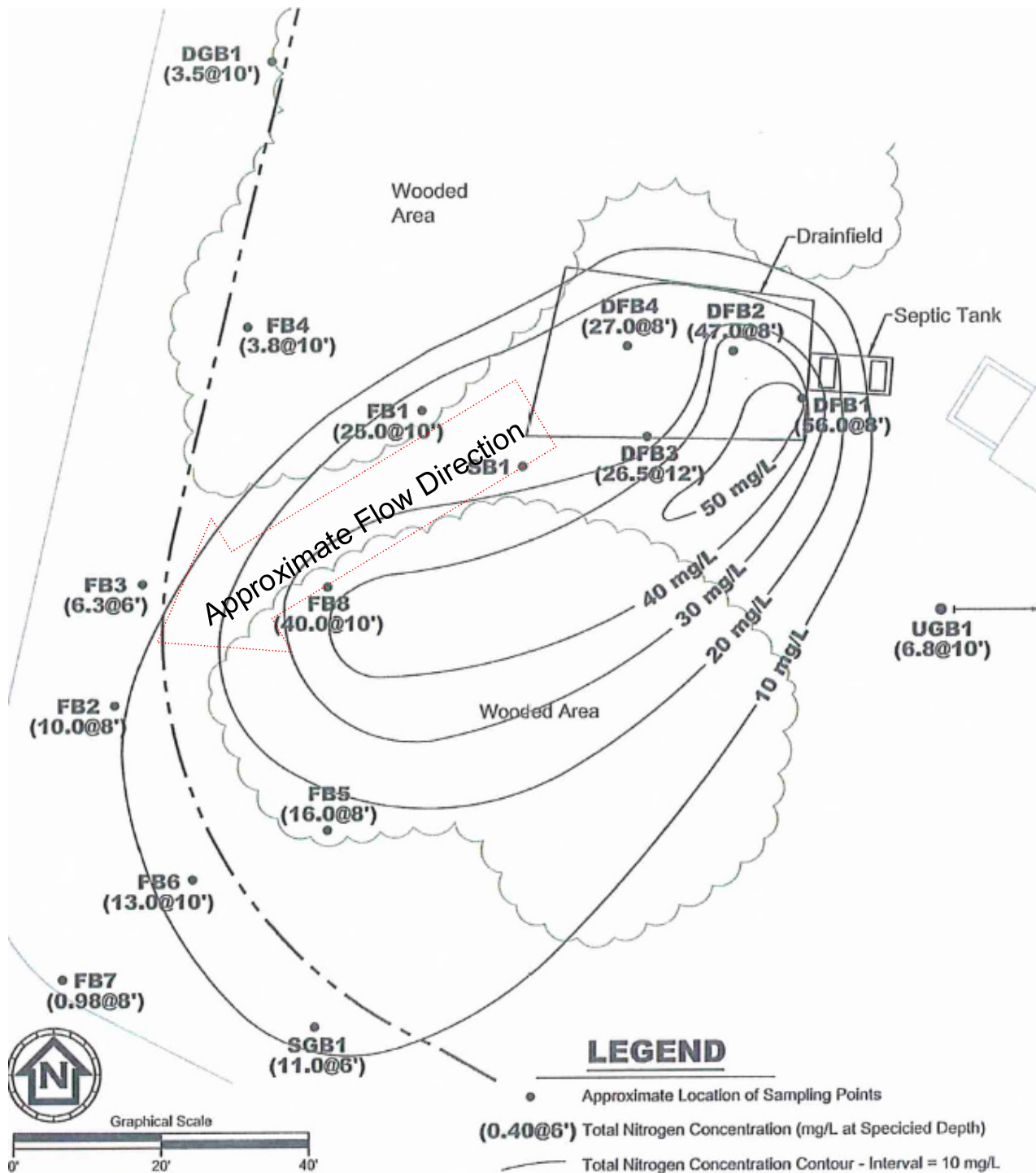
2007 Orange County Site



- WT > 20 ft BGS
- Tavares fine sands near the surface, followed by non-continuous intervals of clay, clayey sands, and fine sands
- Mostly nitrate
- STE C = 69 mg/L

2007 Seminole County Site

- WT~2 ft below DF
- Myakka fine sand
- Soil was expected to show good nitrogen removal but total nitrogen plume, largely unoxidized nitrogen, was extensive
- STE C=74 mg/L





Nitrogen Load to Ground Water

- Nitrogen
 - 20-30 lbs per system released from typical septic tank
 - Some removal (10-50%) under drainfield
 - Further removal depends on ground water conditions
- Total load depends on number of people served by onsite systems and treatment level
- Relative importance depends on presence and magnitude of other sources



How can we manage OSTDS Nitrogen?

- No sewage
- Limit flow and/or number of OSTDS per acre. This approach has been in Florida OSTDS rules for at least 30 years to protect drinking water against nitrate contamination.
- Increased Treatment:
 - Nitrogen reducing treatment at onsite scale (e.g., Keys, Wakulla County)
 - Connect to sewer if treatment is better and more cost-effective



Three Recommendations for Wakulla Springs Restoration

- Springshed-wide management and cost sharing to identify and provide incentives for equitable and cost-effective nitrogen reduction
 - Nitrogen discharge fee (e.g., Chesapeake Bay Restoration Fund)
 - Grant/loan program for wastewater treatment upgrades in priority areas
 - Inventory and track condition of existing onsite systems