



# Septic Systems Need Maintenance?

Presented by:

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<http://www.bfenvironmental.com>



<http://www.water-research.net>



A bit - Younger

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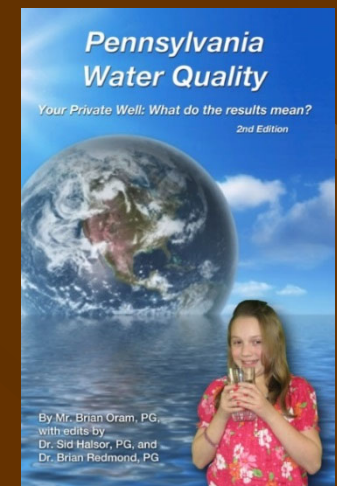
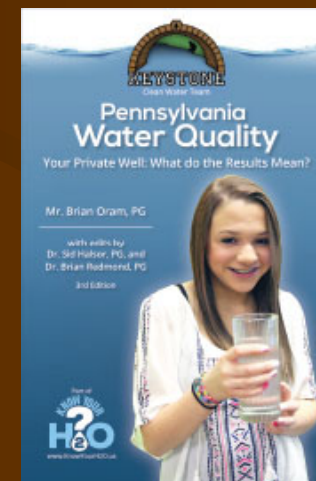
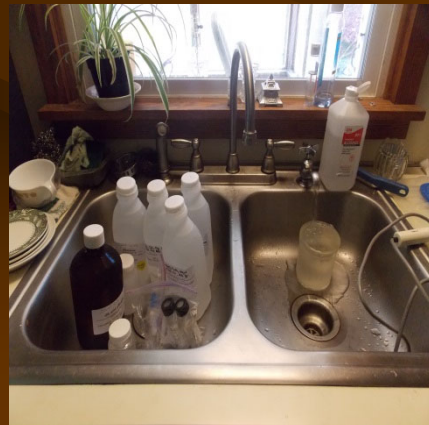




# PACleanwater.org

## Keystone Clean Water Team

Private Well Owner Education  
Source Water Protection Issues  
Groundwater Education  
Alternative, Renewable, and Homegrown Energy Issues  
Training Young Adults and Children about Energy and  
The Environment  
Training Professionals- “Public Outreach”



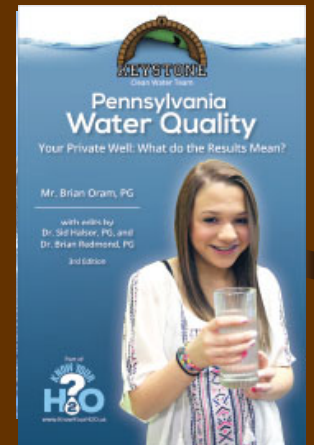
# Water-Research Center

Education and Outreach Program funded by  
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## Outreach Programs

- Environmental and Professional Education and Training for Citizens and Local Municipalities
- Water Quality Help Guides – Information Library
- Community and Business Outreach Programs
- Low Cost – Informational Water Testing Program with National Laboratory
- Student and Citizen Monitoring Programs
- Classrooms Topics: Groundwater, Energy, Career Planning



## Websites:

<http://www.water-research.net>

<http://www.pacleanwater.org>

<http://www.knowyourh20.us>



# Social Media Campaign

## Facebook Campaign

Public Group– Keystone Clean Water Team

Public Group – National Water Testing Program

## Twitter

@PACLEANWATER

@KeystoneWater

@KnowYourH2O





# Online Training

- Continuing Education for Professionals, Teachers, Students, and Citizens
- Offer Online Training Courses ranging basic math and computer skills, GED, and much more.
- Over 10,000 Courses:
- <http://online-training-courses.info>
- Twitter @TrainingPros01

# Note: Presentation Will be Available online

- Please Write this DOWN:
- <http://www.carbonwaters.org>

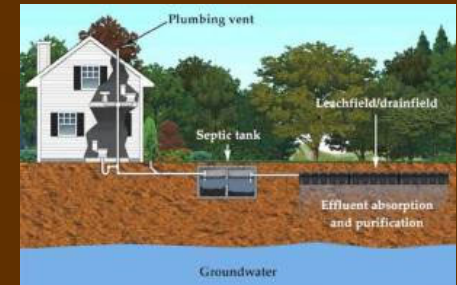


By September 23, 2019- This is one of the Keystone Clean Water Team websites where you will be able to download a color pdf of this presentation (free).



# Why Manage Wastewater – Via On lot Disposal ?

- Reduced Infrastructural and Maintenance Cost
- Lack of Infrastructure
- Protect Human Health and Environment
- Encourage – Groundwater Recharge
- Help to Control and Treat Suspected Endocrine Disrupters in Wastewater



# Managing Sewage with Septic Systems – Why?



Health Reasons and Concerns  
Economic Reasons (infrastructure costs)  
Environmental Impacts and Concern  
(waterborne disease, lake eutrophication  
Nutrients (phosphate))  
Others?



# Septic

- Septic is from the Greek “septikos,” meaning to putrefy or “characterized by putrefaction”.
- Wastewater from a home or a business is generated from toilets, sinks, showers, bathtubs and anything that drains into the septic system.
- Water from toilets are considered **blackwater** and water from sinks, showers, bathtubs are considered **greywater**.
- Blackwater generally contains fecal matter; whereas, grey is generated from processes such as bathing, dishwashing, and laundry, but can contain fecal material.
- Greywater comprises approximately 75% of residential wastewater.

*Sewage*—A substance that contains the waste products or excrement or other discharge from the bodies of human beings or animals and noxious or deleterious substances being harmful or inimical to the public health, or to animal or aquatic life, or to the use of water for domestic water supply or for recreation. The term includes any substance which constitutes pollution under The Clean Streams Law.

# If We Get It Wrong?



Mom – We are going to play in  
The yard – OK?



How Much Is this House Worth?



Anyone for a Drink??



# Waste Strength

- Domestic Wastewater

Pollutant	mg/L	gm/cap/day
BOD5**	200 to 290	35 to 50
COD**		
FOG**	680 to 730	115 to 125
(35 to 65% COD)	230 to 470	40 to 81
TSS	200 to 290	35 to 50
Total Solids	680 to 1000	115 to 170
T. Nitrogen*	35 to 100	6 to 17
Ammonia*	6 to 14	1 to 3
Total Phosphorous	18 to 29	3 to 5
Fecal Coliform*	$10^8$ to $10^{10}$	*****
Total Coliform*	$10^{10}$ to $10^{12}$	*****
E. coli.*	$10^8$ to $10^{10}$	****
Surfactants*	4 to 8	0.6 to 1.5



$10^8$  – 100,000,000 colonies per 100 ml

# Waterborne Pathogens

Organism	Disease/ Symptoms
<b>Bacteria</b>	
Salmonella sp.	Salmonellosis (food poisoning), typhoid fever
Vibrio cholerae	Cholera
Campylovacter jejuni	Gastroenteritis
<b>Enteric Viruses</b>	
Hepatitis A virus	Infectious hepatitis
Norwalk and Norwalk-like viruses	Epidemic gastroenteritis with severe diarrhea
Rotaviruses	Acute Gastroenteritis with severe diarrhea
Reovirus	Respiratory infections, gastroenteritis
<b>Protozoa</b>	
Cryptosporidium	Gastroenteritis
Giardia lamblia	Giardiasis (including diarrhea, abdominal cramps, weight loss)
Balantidium coli	Diarrhea and dysentery
Toxoplasma gondi	Toxoplasmosis
<b>Helminth Worms</b>	
Ascaris lumbricoides	Digestive and nutritional disturbances, abdominal pain, vomiting, restlessness
Necator americanus	Hookworm disease
Hymenolepis nana	Taeniasis
Toxocara canis	Fever, abdominal discomfort, muscle aches, neurological symptoms

# Regulations for On-lot Sewage

- On Jan.24, 1966, the Pennsylvania Sewage Facilities Act (Act537, as amended) was enacted to address existing sewage disposal problems and prevent future problems. To meet these objectives, the act requires proper planning of all types of sewage facilities, permitting of individual and community OLDS, as well as uniform standards for designing OLDS.
- DEP regulations that address the administration of the Act 537 planning process are found in Title25, Pa. Code, Chapter71.Rules for the OLDS permitting process are found in Chapter 72 and technical standards addressing the design of OLDS in Pennsylvania are found in Chapter 73.
- Act 537 requires local or joint-local agencies, through their SEO, to manage the permitting program for individual on-lot disposal systems and community on-lot systems with design flows of 10,000 gallons-per-day or less. An individual OLDS is a system that serves a single lot, while a community OLDS serves two or more lots.

Therefore, there are a combination of state and local agencies involved in the sewage planning and permitting process.

# Equivalent Dwelling Unit

- Based on 400 gpd – Single, Multiple Family Dwelling, Commercial or Industrial.
- 1 EDU is equivalent to a flow of 400 gpd.
- Standard – 3 bedroom house – 400 gpd with an additional 100 gpd for each additional bedroom.



# What is a Community System?

- **Community Sewerage System (Ch. 71.1 – Definitions)**
  - **Community Sewage System** – “ a sewage facility, whether publicly or privately owned, for the collection of sewage from two or more lots or two or more equivalent dwelling units and the treatment or disposal or both of the sewage on one or more of the lots or at another site.
  - Options:
    - **Community On-lot Sewage System (soil-based renovation approach or retention tank)**
    - **Community Sewerage System (non-soil based renovation approach)**

# Land-Based Wastewater Management

- Regulated by Act 537 – Chapter 73
- Options Depend on Evaluation of Soils and Site Conditions
- “Conventional”
  - In-ground Systems (Beds/ Trenches)
  - Elevated Sand Mound and Trenches
  - Spray Irrigation (IRSIS)
  - Retaining Tanks (Chemical Toilet, Privy, Incineration, Compositing, Holding Tank)



# Land-Based Wastewater Management

- “Alternative”
  - Evapotranspiration System
  - Greywater System
  - UV Disinfection Unit
  - Leaching Chambers
  - Micromound Systems (variety)
  - Flow Equalization System
  - At-Grade Absorption System
  - Alternative Aggregates
  - Siphon (Flout)

Alternatives addresses issues with:  
Depth to Limiting Zone or Condition  
Slope  
Usage  
Provide Alternative Materials  
Waste Strength Issues  
Lack of Power

# The Typical System in the Poconos

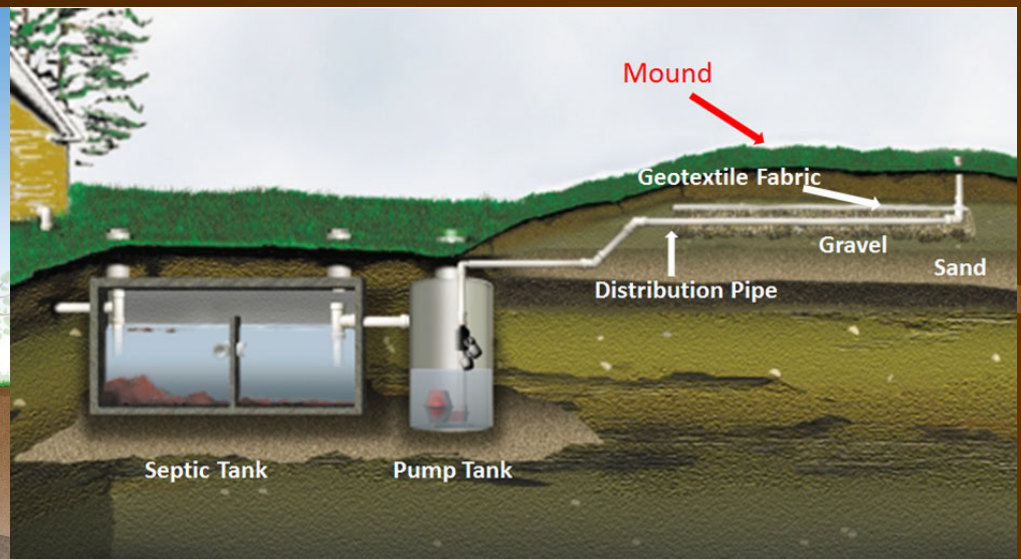
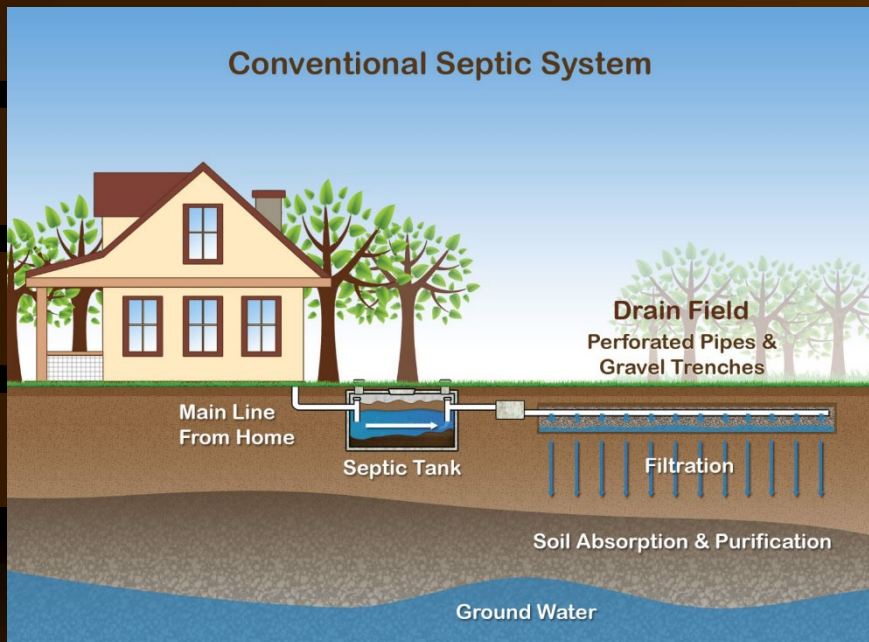
- Septic Tank – older systems have a **single compartment**; newer system have a **double compartment tank** or there are **aerobic** treatment tanks (Goal: Primary Treatment)
- Non-Pressurized Systems may have **Distribution Box**.
- Pressurized Systems has a **dosing tank** and some near systems have **flow equalization**.
- **Absorption System** – in-ground bed or trench or elevated sand mound bed or trench- **“Needs to be Aerobic”**  
(Goal: Secondary Treatment)

Primary Treatment – Separate Solids/Grease – Convert Organic Nitrogen to Ammonia

Secondary Treatment – Convert Ammonia to Nitrate and Reduce Bacteria and Waterborne Pathogens

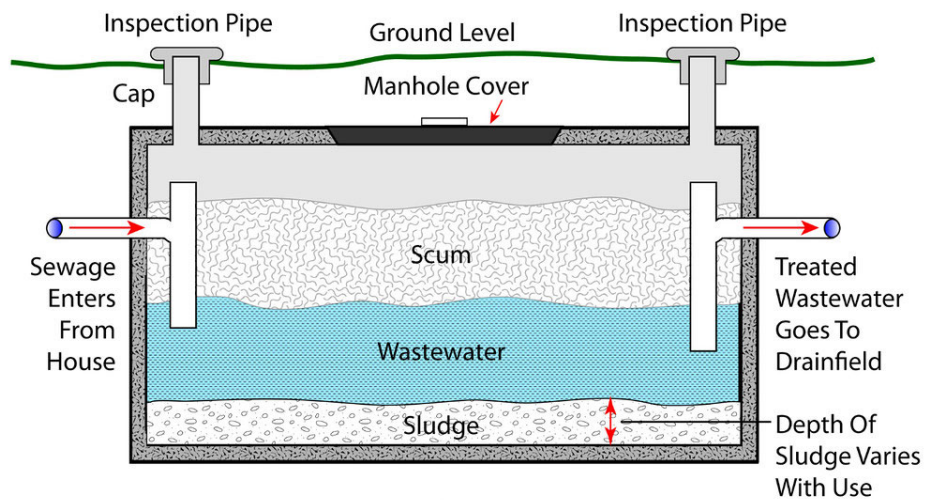


# Some “Conventional Systems”



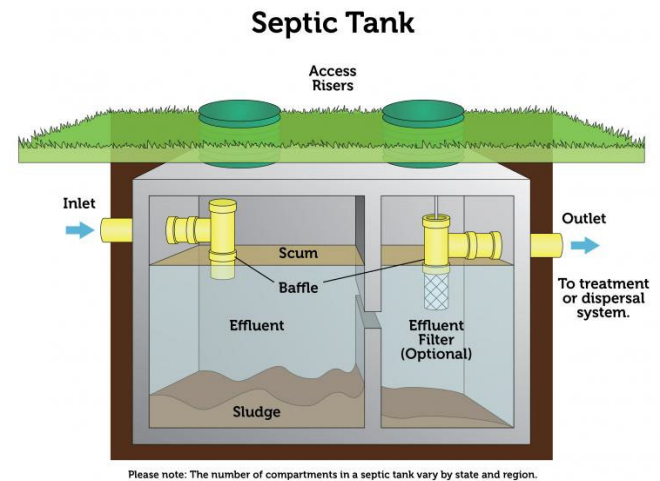
In some cases, an aerobic treatment tank is added or some other filtration system.

# Septic Tank



**Schematic of a Septic Tank**

Before 1997



After 1997

# Septic Tank Effluent

Parameter	Mean	Range	Units	% Reduction
BOD	138	7 to 480	mg/L	52.4
COD	327	25 to 780	mg/L	55.2
TSS	49	10 to 695	mg/L	83.1
T. Nitrogen	45	9 to 125	mg/L	Insignificant
Oil and Grease	22	20 to 25	mg/L	70 to 80
Phosphorous	20	14 to 24	mg/L	15
Bacteria	*****	*****	*****	Insignificant

Insignificant reductions in bacterial populations – may be some natural die off because of environment and for nitrogen reductions are insignificant, but organic nitrogen is typically converted into ammonia and nitrite and ultimately nitrate.

# NSF Rating (Aerobic Tanks)

- NSF/ANSI 40 is a standard for residential wastewater treatment systems between 400 and 1,500 gallons per day.
- Class I systems: 30-day average effluent quality of 25 mg/L CBOD5 and 30 mg/L TSS or less, and pH 6.0-9.0 spanning six months of testing. System service and maintenance are prohibited during the test period.
- Class II systems – no more than 1 % of samples have a CBOD over 60 mg/L or a TSS over 100 mg/L.

Chapter 73.32 – Flows < 1500 gpd – NSF 40.

> 1500 gpd – Must have data based on NSF's Protocols

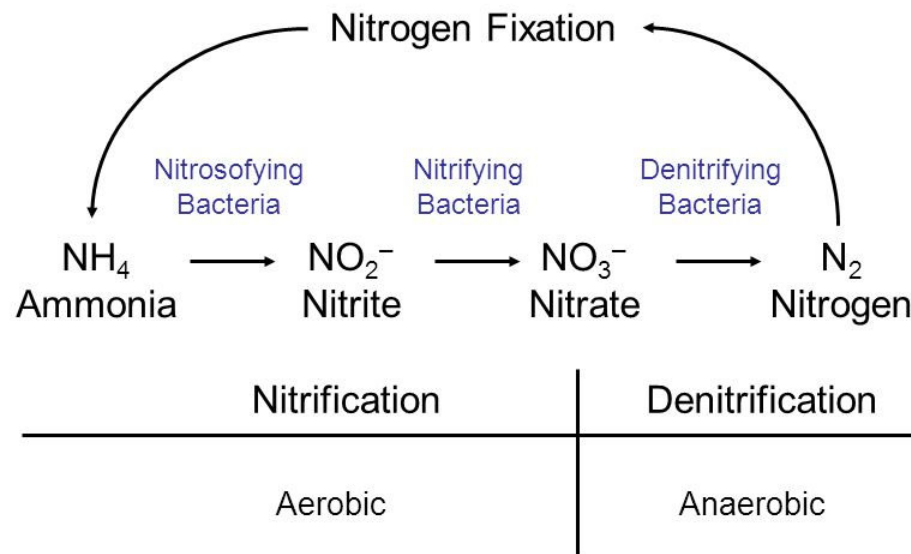
If system includes a disinfect component, assume if proper operation the level of **fecal coliform** is at **< 1000 colonies per 100 ml**.



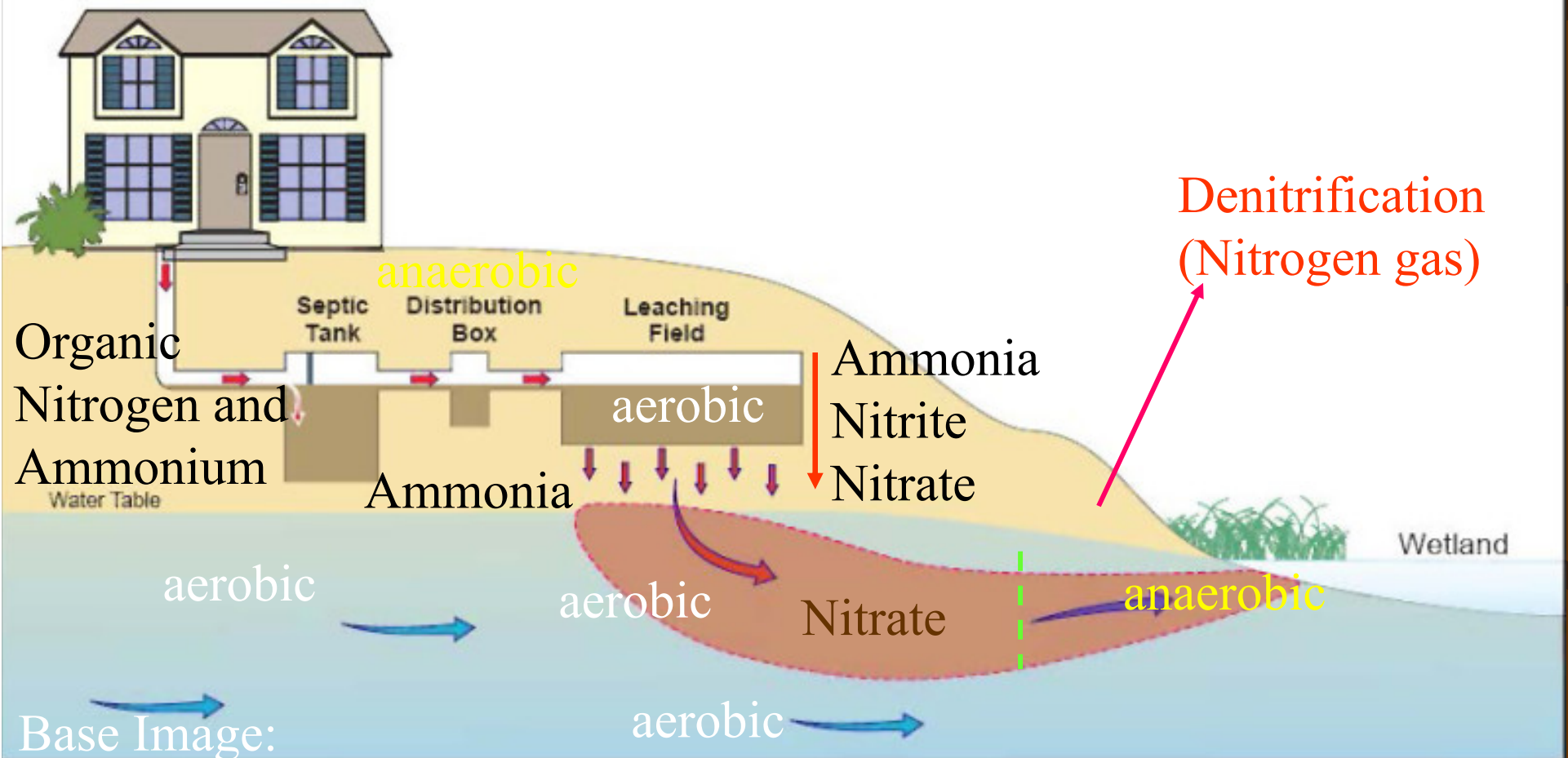
# Nitrogen Cycle (Simplified)

Not Really A Loss – More Like Transformation for  
“Conventional Systems – Absorption Area/ Aerobic Tank”

## Simplified Nitrogen Cycle



# Nitrogen More of a Transformation



<http://www.savebuzzardsbay.org/current-issues/nitrogen-pollution/>

# My Trip to Outer Banks





# Keys to System Operation

- Proper Planning (Local Agency, PADEP, and an Informed Public/User).
- Proper Siting and Design (Local Agency and Experts)
- Proper Installation (Local Agency, Contractor, and Informed User)
- Proper Maintenance (THE USER)

Your Local Agency has a nice online book

<http://www.dingmantownship.org/SewageForms/SewBook1.pdf>



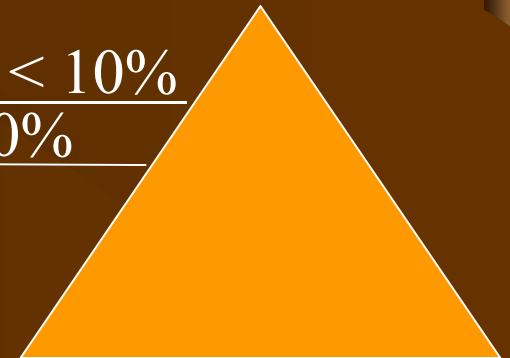
## Most Common Causes of a “Malfunction”

- Lack of Pumping – Septic Tank (Solid or Grease Loss from Tank- Clogs disposal bed).
- Hydraulic overloading of the system- The system is not water tight and there is infiltration of rainwater, runoff, or groundwater.
- Mass overloading the system or disrupting biological community – putting in too much or high than normal amounts of grease, decomposable solids, or materials that do not readily decompose (wet wipes, cigarette butts, plastics, paints, hair, very acidic solutions, very caustic solutions, strong cleaning agents, contraceptives, dental floss, petrochemicals) .
- Steep gradient inlet piping and failures of gas deflectors/ baffles.
- Turning off the aerobic tank.
- Physical damage to piping or system.

Event Based Damage/ Planning Decisions - < 10%

Design or Installation Issue (Bad Sand) - < 20%

Improper Use/Maintenance – 70 %





# If you do not maintain the system

- 1. Failing septic system can be a threat to public health and the environment, especially your drinking water supply or nearby recreational waters.
- 2. Reduces YOUR Property Value and has a negative aesthetic impact.
- 3. The system is expensive to repair and may require frequent pumping of your septic tank, possibly the installation of a holding tank, or the possibility that you have to MOVE OUT of Your HOME.
- 4. Frequent back-ups of sewage or sewage gases into your home or your neighbors property.
- 5. This can be classified as a nuisance and vulnerable to litigation and violation of the Clean Stream Law and other ordinances or laws.

# Warning Signs of a Problem

**A few warning signs that you may have a problem:**

- Slow drainage of sinks and toilets, piping clogs, frequent back-ups, and need for very frequent pumping.
- Very green grass or growth near saturated soil conditions over or surrounding drain field. Foul smell and sewage odors occasionally.
- Dosing tank alarm is going off.

**You have a problem (TOO LATE)!**

- Sewage water surfacing over the drain field or disposal bed.
- Contaminated water (surface water or groundwater)
- People Sick !

# THE DO NOTs

- Add excessive amounts of harsh chemical to the system. Normal household cleaners in normal amounts should harm the system, but highly concentrated solutions or toxic chemicals may upset the system.
- Do not drive, park, or store heavy objects over the on-lot subsurface disposal area.
- Do not pour cooking oils, lard, cooking fats or greases down the drain. Try to separate this waste and dispose as part of the household trash.  
(Composting is good !)
- Do not connect cellar drains, sump pumps or rain downspouts to the septic tank system.
- Put disposable diapers, sanitary napkins, condoms tampons, cigarette butts, or other materials containing non-biodegradable substances into the system.
- Do not waste water and do not install high water use device without determining the capacity and capability of the system.

# The Do NOTs (MORE)

- Do not concentrate water usage, spread out high volume use throughout the week. This would include eliminating wash day and it would be better to run dishwashers and clothes washers on separate evenings or low water use periods.
- Do not plant trees over or near the soil absorption systems. Roots could clog or damage the drainage pipes.
- In general, septic tank cleaners or enzymes are not needed for residential systems and by no means should this replace the regular septic tank pumping. In some cases, these cleaners cause the sludge blanket to be carried into the absorption bed, which causes the absorption area to become clogged and avoid high subsiding detergents.
- Never turn off and aerobic tank, even if you are going away for a short trip.



# The Pumping Table

## Septic Tank Pumping Frequency Function of Tank Size and Household Population (assuming no garage grinders)

Tank Size (gal)	2 people	3 people	4 people	5 people
900 gal	5.2 yrs.	3.3 yrs.	2.3 yrs.	1.7 yrs.
1000	5.9	3.7	2.6	2
1250	7.5	4.8	3.4	2.6
1500	9.1	5.9	4.2	3.3
1750	10.7	6.9	5	3.9
2000	12.4	8	5.9	4

For most cases – 3 bedroom home – 3.5 People (every 3 years)

**Note: Assuming normal use with no garbage grinders**

**Source: The Pennsylvania State University Fact Sheet SW 161.**



# The Does (At Design)

- Install a properly designed and sized system. If a maintenance plan is not provided by the designer or township, it would be advisable to have your design consultant prepare a maintenance plan for your system.
- Avoid construction on wet soil. If the soil is worked while wet smearing and increased compaction could greatly reduce soil permeability and infiltration rate.
- The pumps for pressure distribution systems with an audible and visual alarm to alert you to problems.
- Ensure or require a replacement area is identified on the property.
- Maintain records regarding the original site testing, permitting, and design.

# The Does (USE)

- Properly use and maintain the system, which includes pumping the septic or aerobic tank, inspecting the system, cleaning laterals and/or delivery lines, and other maintenance items specific to the system.
- Divert surface water and roof runoff away from the septic tank and soil absorption area.
- Take showers rather than a bath and install low flow water conservation devices.
- Operate dishwashers and cloth washers with only full loads and spread out the water usage throughout the week. It is better to run these machines many times during the week rather than on the same day.  
**NO MORE WASH Day !.**
- Maintain records inspection, maintenance, and repairs to the system.
- The pumps for pressure distribution systems with an audible and visual alarm to alert you to problems (DO NOT TURN OFF).

# PA Perspective on On-Lot Disposal

- Website Resources

<https://bfenvironmental.com/septic-sytems/septic-systems-pa-perspective.html>

<http://www.pacode.com/secure/data/025/chapter73/chap73toc.html>

<http://websoilsurvey.nrcs.usda.gov>

<http://www.pdma.net/> (Sewage Management)

<https://bfenvironmental.com/documents/bf-environmental-septic-water-reuse-manual.pdf> (Water Re-Use PA)

<http://www.dingmantownship.org/SewageForms/SewBook1.pdf>

## On-line Training Courses Related to On-lot Disposal

<https://webdesignpros.redvector.com>



# References

- <https://www.dep.pa.gov/Citizens/My-Water/SepticSystems/Pages/default.aspx>
- <https://www.dep.pa.gov/Business/Water/CleanWater/WastewaterMgmt/Act537/OnlotDisposal/Pages/OnlotAlternateTechnologyListings.aspx>
- <https://bfenvironmental.com/septic-sytems/septic-systems-pa-perspective.html>
- <http://www.dingmantownship.org/SewageDep.html>
- <http://www.dingmantownship.org/SewageForms/SewBook1.pdf>



# Call Before YOU Dig!

- Pennsylvania Act 287 of 1974 requires that any person who intends to dig into the ground must call the PA ONE CALL SYSTEM at least three days prior the start of digging!
- Failure to call and secure a ONE CALL number may result in the penalties that are provided for by law.



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