Benzie-Leelanau District Health Department
Benzie-Leelanau District Health Department

• Tri-county Health Dept. Until 1990.
• G.T. County H.D. contract until 1996.
• Environmental Health regulations adopted in 1972 requiring sewage disposal and water well permits.
• 48 inch isolation distance to groundwater established at that time.
• Board of Health approval of holding tanks due to pressure to build in unsuitable locations.
Sanitary Code

- Drainfield 48 inches to water table.
- Tank and field 50 feet from well.
- Tank and field 50 from surface H2O.
- Bedrooms determine size of system.
- Garbage disposal increases tank size.
- Soil type and texture...Permeability.
- Percolation Rate < 45 min. per inch.
- Inadequate space...lot too small.
This sphere measuring 860 miles in diameter represents all of Earth’s water.
Every Drop Counts
The Water Cycle

- Precipitation
- Condensation
- Solar energy
- Water-vapor transport
- Infiltration
- Runoff
- Evapotranspiration
- Evaporation
- Groundwater flow
- Ocean
WATER FACTS
WATER FACTS

• A typical cumulus cloud measuring 1Km x 1Km weighs 1.1 million pounds!
• 71% of Earth is water covered!
• The oceans hold 96.5 % of all water!
• USA Uses 410 billion gallons per day!
• Groundwater equals 1.69% of all water!
• Lakes contain 0.013% of all water!
• A drop of water spends 8 days in the atmosphere and 3000 yrs. in the ocean!
There is a very small amount of the Earth’s water that is drinkable (less than 1%), so we have to try very hard keep it clean!
• What am I?
2 Common Types of Wells

Potentiometric Surface and Flowing Wells
Water Wells: How Are They Made?
Water Wells: How They Work
Water Wells: How They Work
Water Wells: How They Work
Water Wells: How They Work
What happens to the water we use? Where does it go?
Sewage Treatment Plant if you live in the city.
Your Backyard if You live in Rural America
Septic Systems:

How a Septic System Works

Main Line from Home

Drain Field
Perforated Pipes and Gravel Trenches

Filtration

Soil Absorption and Purification

Groundwater

Wastewater from the home enters the septic tank where solid waste or “sludge” settles out. The liquid waste then flows into a distribution system, usually a drainfield where it is dispersed into the soil.
Septic Systems: How They Work

- Flush to Septic Tank
Septic Systems: How They Work

• Inside the tank
## Septic Systems: How They Work

<table>
<thead>
<tr>
<th>Organism</th>
<th>Concentration MPN/100ml</th>
<th>Infectious dose MPN/100ml</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bacteria</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coliform, fecal</td>
<td>$10^6 - 10^8$</td>
<td>$10^6-10^{10}$</td>
</tr>
<tr>
<td><em>Shigella</em></td>
<td>$10^0 - 10^2$</td>
<td>10-20</td>
</tr>
<tr>
<td><em>Salmonella</em></td>
<td>$10^2 - 10^4$</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Protozoa</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Cryptosporidium</em></td>
<td>$10 - 10^3$</td>
<td>1-10</td>
</tr>
<tr>
<td><em>Parvum oocyst</em></td>
<td>$10^3 - 10^4$</td>
<td>&lt;20</td>
</tr>
<tr>
<td><em>Giardia lamblia cysts</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Helminths</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ova</td>
<td>$10-10^3$</td>
<td>N/A</td>
</tr>
<tr>
<td><em>Ascaris lumbricoides</em></td>
<td>N/A</td>
<td>1 - 10</td>
</tr>
<tr>
<td><strong>Viruses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enteric virus</td>
<td>$10^3 - 10^4$</td>
<td>1-10</td>
</tr>
<tr>
<td>Coliphage</td>
<td>$10^3 - 10^4$</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Septic Systems: How They Work

- Living in the tank
Septic Systems: How They Work

• Septic Tank to the Drain Field
Septic Systems: How They Work

• Drain field construction
Septic Systems: How They Work

- Living in, on, & under the drainbed

Aerobic Bacteria
Nematodes
Earthworms
Grass
Plus Much More
The Water Cycle
Septic Systems: Will they work forever?

- Inside the tank
Septic Systems: Will they work forever?

- Drain field construction
I NEVER had to pump my tank!
Septic Systems: When They Go Bad
Or REAL Bad
Septic Systems: Maintenance

- Maintaining the system
Septic Tank Effluent Filters
My grandpa planted that tree!
NEVER DUMP MEDICATIONS DOWN TOILET
RESIDUAL MEDICATIONS AFFECT WILDLIFE and PEOPLE
Don’t even think about it!
Spread Out Laundry Throughout the Week
More is NOT Better.

Bleach and detergents.

Easy does it or use dryer sheets.
Check for leaking plumbing and unnecessary connections to sewer.
One Drop every second equals 2054 gallons per year.
Chemical and Biological additives are not recommended and in some cases have been banned due to groundwater contamination. These products are expensive and in most cases experts indicate little if any value to their use.
Use less toilet tissue. Non-quilted varieties break down quicker in the tank.
Know Your Options
Pump your tank(s) every 3-4 years for your average home. Adjust as necessary.
Where do they take IT?

Land Application Site

Septage Receiving Facility Treatment Plant
What we have to Lose!
Surface Water Contamination

Swimming Forbidden!
The Board of Health
ACUTE GASTROENTERITIS SYMPTOMS:

- Stomach cramps
- Diarrhea
- Nausea
- Vomiting
- Fever
The Water Cycle & Contaminants
DOWNWARD LEAKAGE AROUND UNGROUTED CASING

UNCONFINED AQUIFER

STATIC WATER LEVEL

UNSEALED ANNULAR SPACE AROUND CASING

INfiltration of surface contaminants

CONTAMINANT PLUME

DOWNWARD LEAKAGE

UNCONFINED AQUIFER
The Water Cycle & Contaminants
Would this “well cap” and this well casing keep contaminants out of the well?
This well cap (1-19-15) damaged by a garden tractor. Notice insect nests and gypsy moth egg cluster. Earwigs love living in your well
Another damaged well discovered during Point of Sale Inspection. (2-23-15)
Why do we require permits???

Feb. 9, 2015
Bathtub, sink, kitchen sink and laundry discharge to Betsie River. Feb.9, 2015.
Holding tank overflow (1-2-15). Sewage was found flooding street and icing up roadway. Notice dog tracks and human foot prints in slush.
Top ten do not flush list.

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>2. Condoms</td>
<td>7. Band-aids</td>
</tr>
<tr>
<td>3. Cotton Balls &amp; Swabs</td>
<td>8. Dental Floss</td>
</tr>
<tr>
<td>5. Paper towels</td>
<td>10. Cat litter</td>
</tr>
</tbody>
</table>
And #11... Diapers.

THE END