Development of a Standard for Gravelless Trench Products
- Results of a Pilot Protocol Series -

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National Sanitation Foundation (NSF) standards are formed with participation from industry, regulator and users.

Wastewater Standards

- NSF/ANSI Standard 245: Wastewater Treatment Systems – Nitrogen Reduction
- NSF/ANSI Standard 40

The purpose of a standard test is to provide performance data for a product under controlled "standard" conditions.

Qualities of a Standard Test

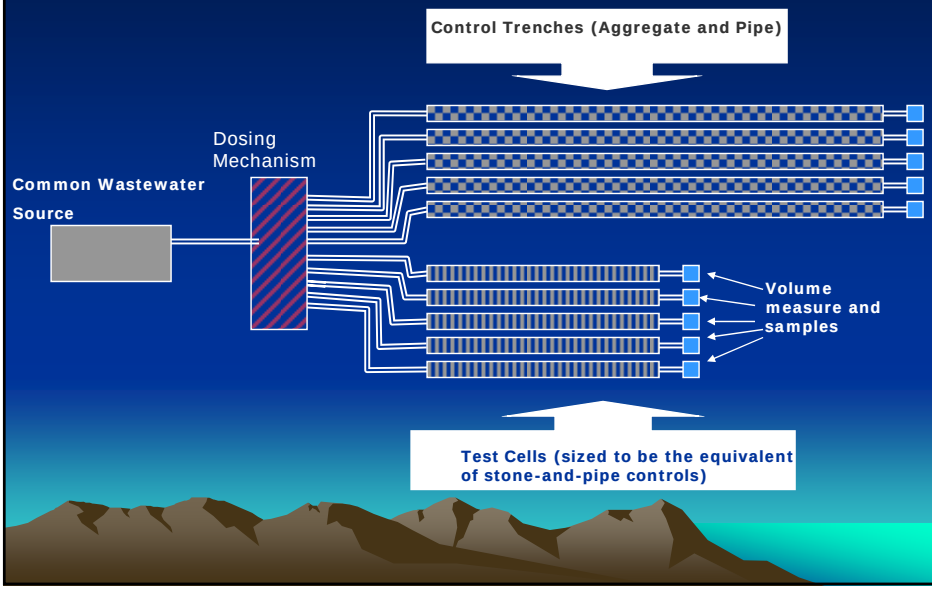
- **Ability to be conducted at various locations (i.e. is reproducible).**
- **Results of the test have reasonable applicability to "real life" situations (or at least offer the ability to extrapolate to real life situations).**

What about standards for gravelless leachfield products ?

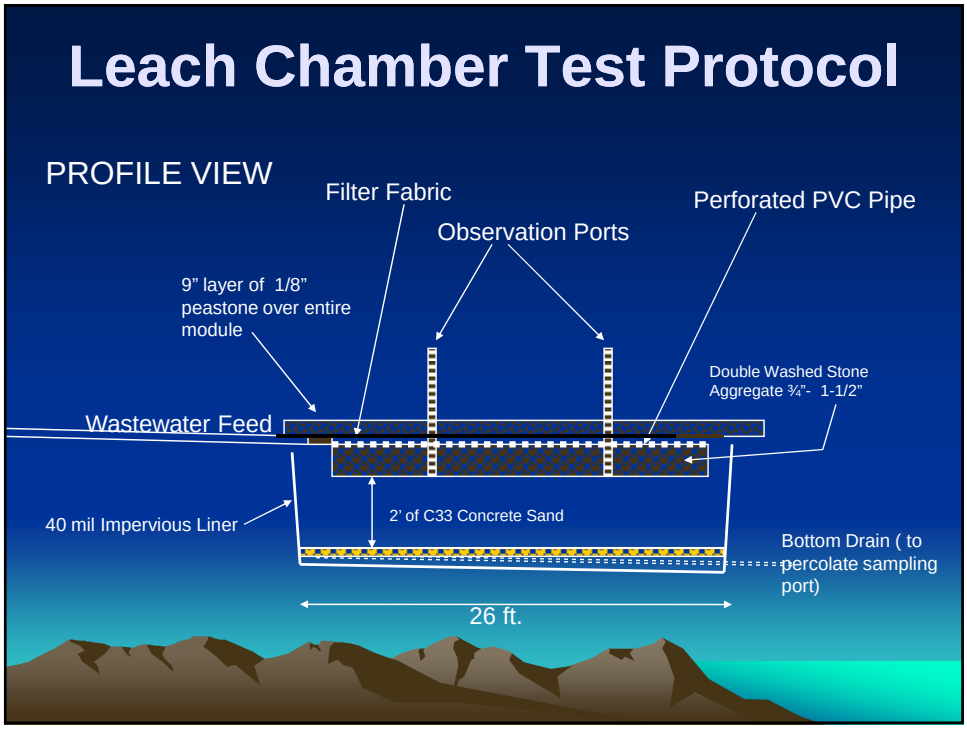
Pilot Effort

- Construct ten test cells (five control gravel trenches and five gravelless trenches)
- Test cells sized in accordance with manufacturer's claim for reduction credit.
- Conduct sampling and make observations for at least 12 months.

Leach Chamber Test Protocol



Leach Chamber Test Protocol



Each test cell was placed in its own liner. Sand was compacted in 6-inch lifts.

Each test cell was compacted to an estimated "standard" firmness to the elevation of the basal area of the soil absorption component.

After each test cell was compacted to an estimated and standard degree, soil core samples were taken to verify soil in-place properties.

Stone trenches were constructed having the same basal width as the gravelless product.

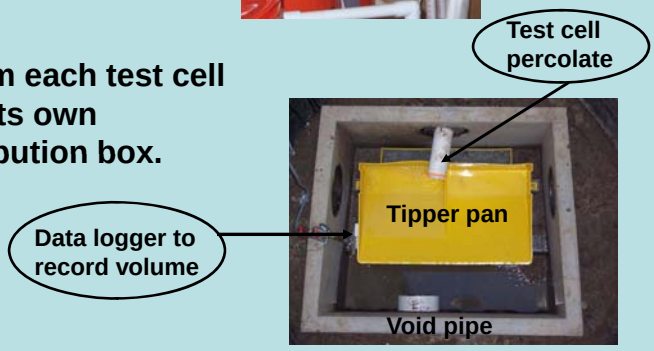
Gravelless structures were sized according to reductions (in comparison with stone trenches) specified by the manufacturer.

**Details blurred to prevent the identity of product used in pilot tests.

All test cells were covered with a permeable fabric cloth to prevent plant growth.

Each test cell was individually supplied wastewater by a calibrated dosing bucket.

The effluent from each test cell was drained to its own collection distribution box.



Question

Can 10 test cells be constructed with adequate consistency?

Physical Property Comparisons

	Gravel	Gravelless
Uniformity Coefficient (D_{60}/D_{10})	3.15	3.13
Effective Grain Size (D_{10})	0.28	0.26
Dry Bulk Density	1.69	1.67
Saturated Hydraulic Conductivity	2.10	2.18
Porosity	28.80	29.02

No significant differences

Physical Property Comparisons

	Gravel	Gravelless
% water drained at 30 cm tension.	**60.31***	**51.38 ***
% water drained at 50 cm tension.	**86.74 ***	**75.89 ***
% water drained at 200 cm tension.	**92.57 ***	**90.61 ***
% sand	99.17	99.13
% silt	0.56	0.64
% clay	0.26	0.23

*** SIGNIFICANT DIFFERENCES BETWEEN GRAVEL AND GRAVELESS**

Shoulda Coulda Woulda

OR

Things we should/would/could have done differently to improve pilot test

- All cells should have been made the same length.
- The assignment of test and controls should have been randomized.

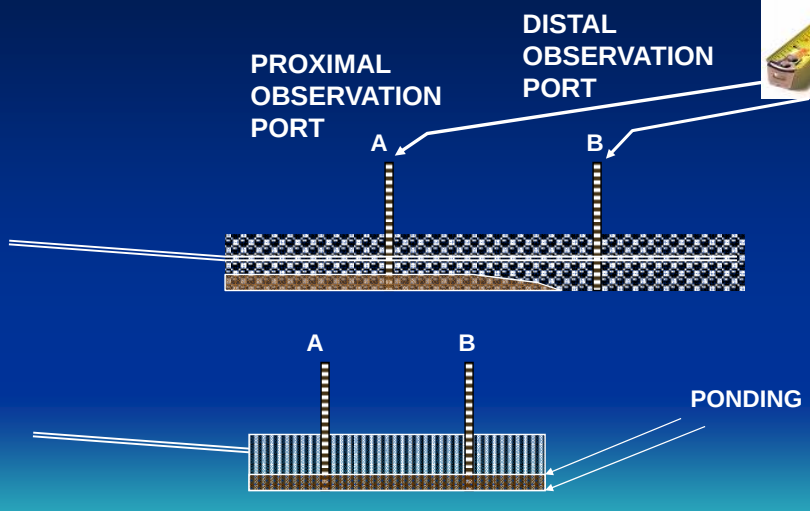
RESULTS

PONDING

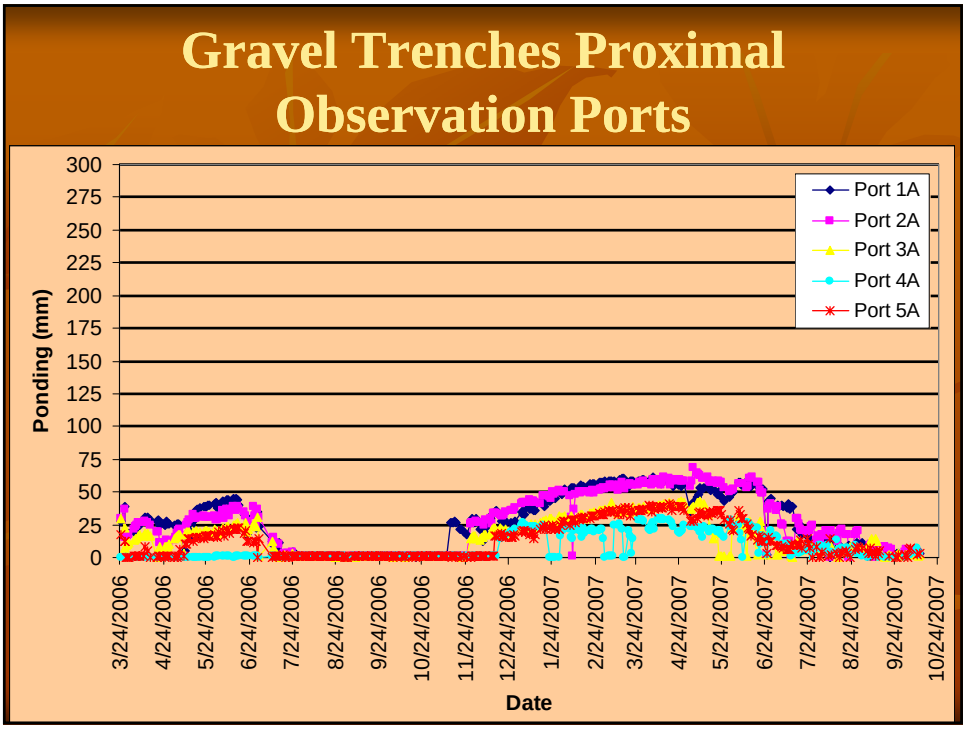
The height of wastewater in the void area of the leaching facility

Ponding is a surrogate measure of effluent acceptance rate.

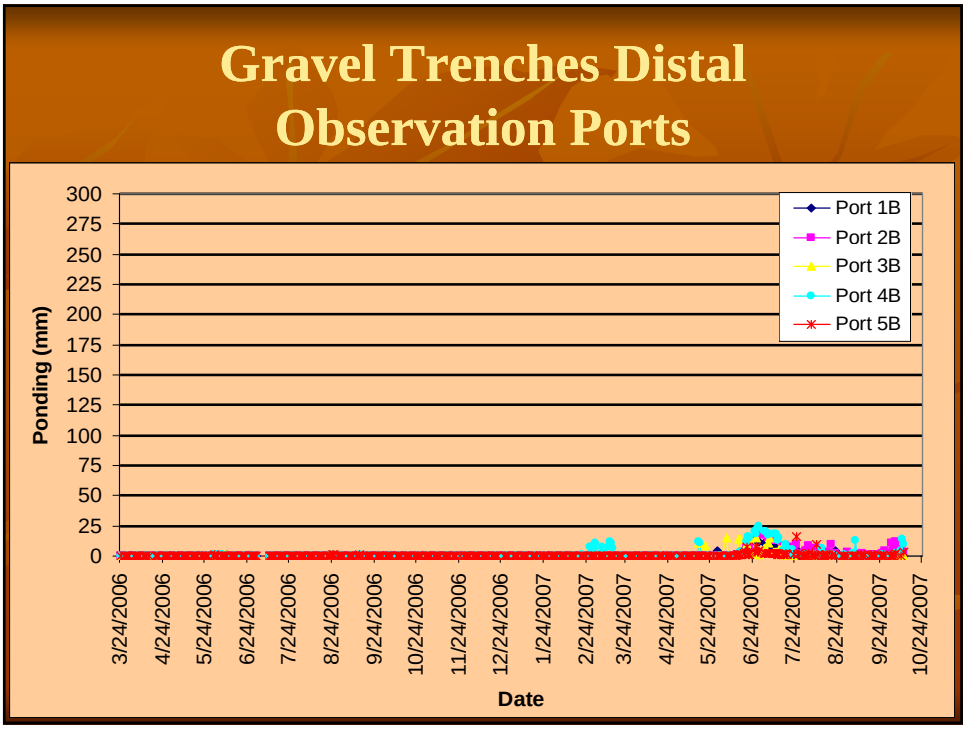
Ponding Measurements



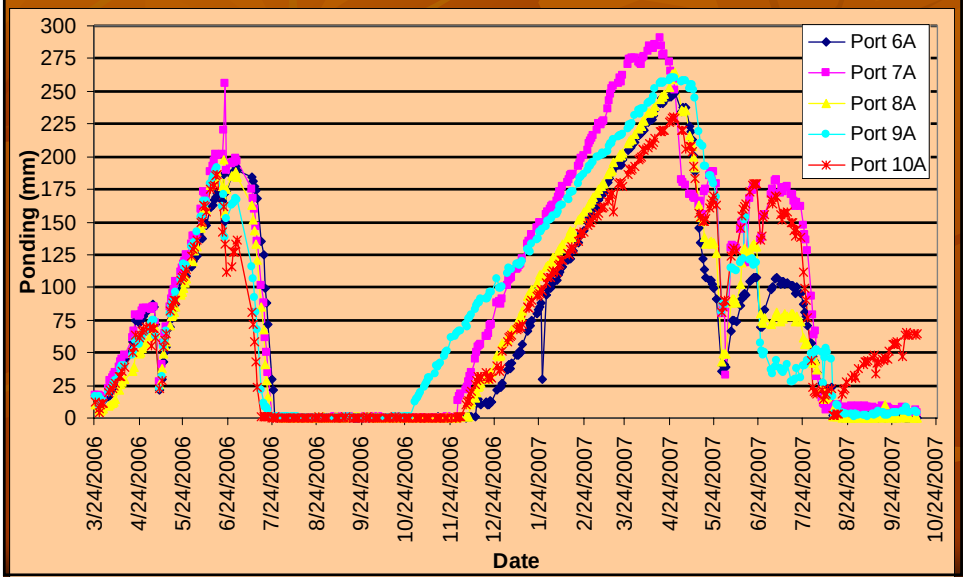
Gravel Trenches Proximal Observation Ports



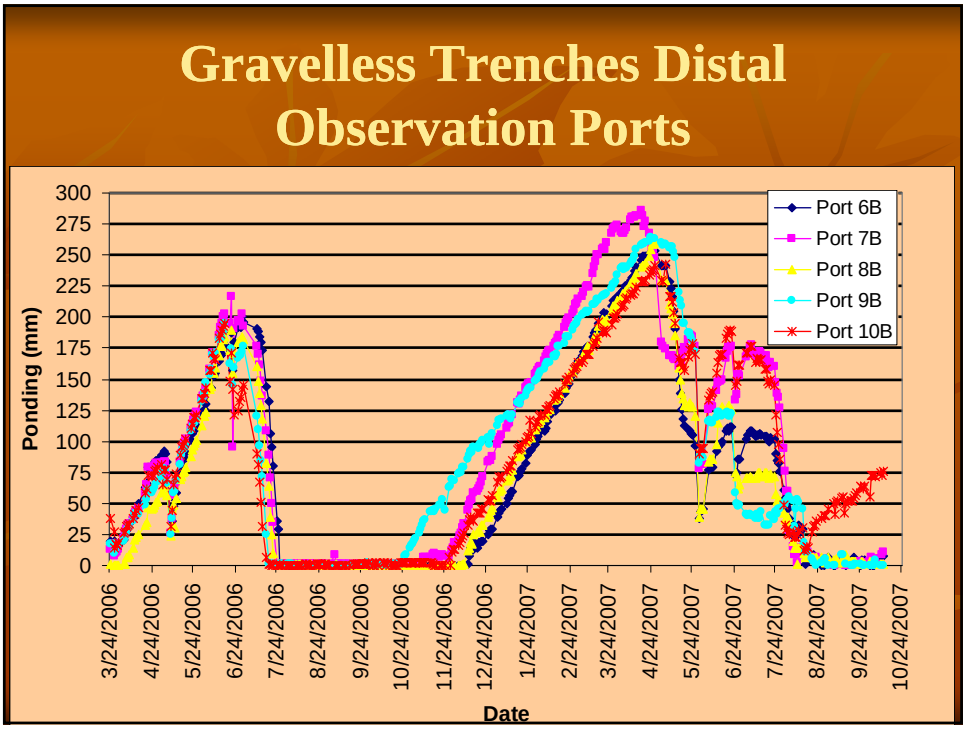
Gravel Trenches Distal Observation Ports

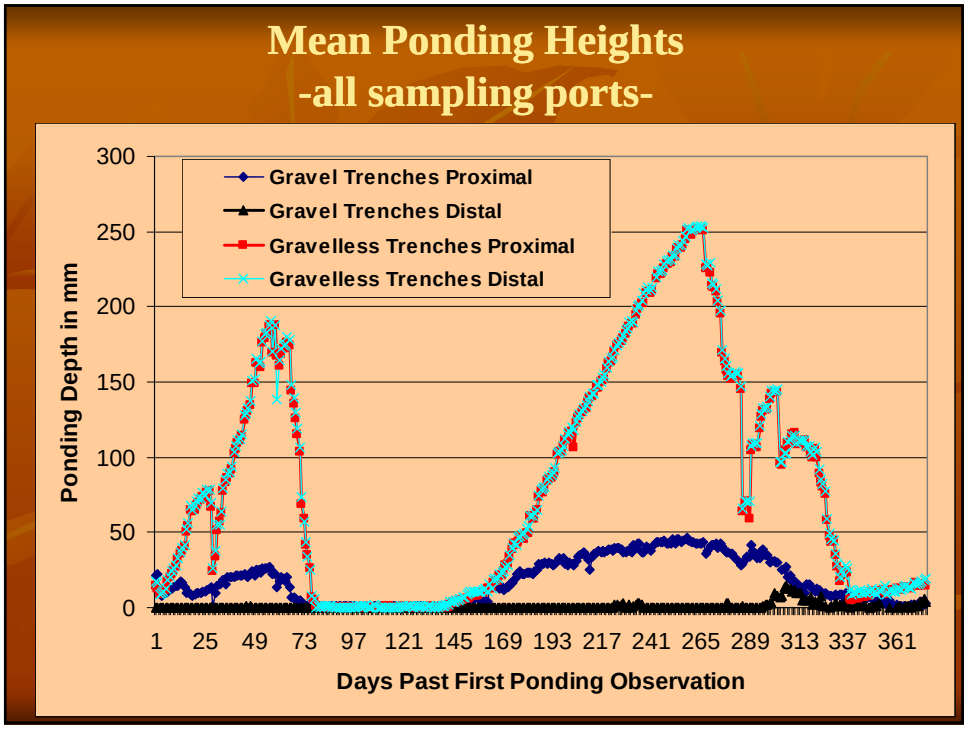


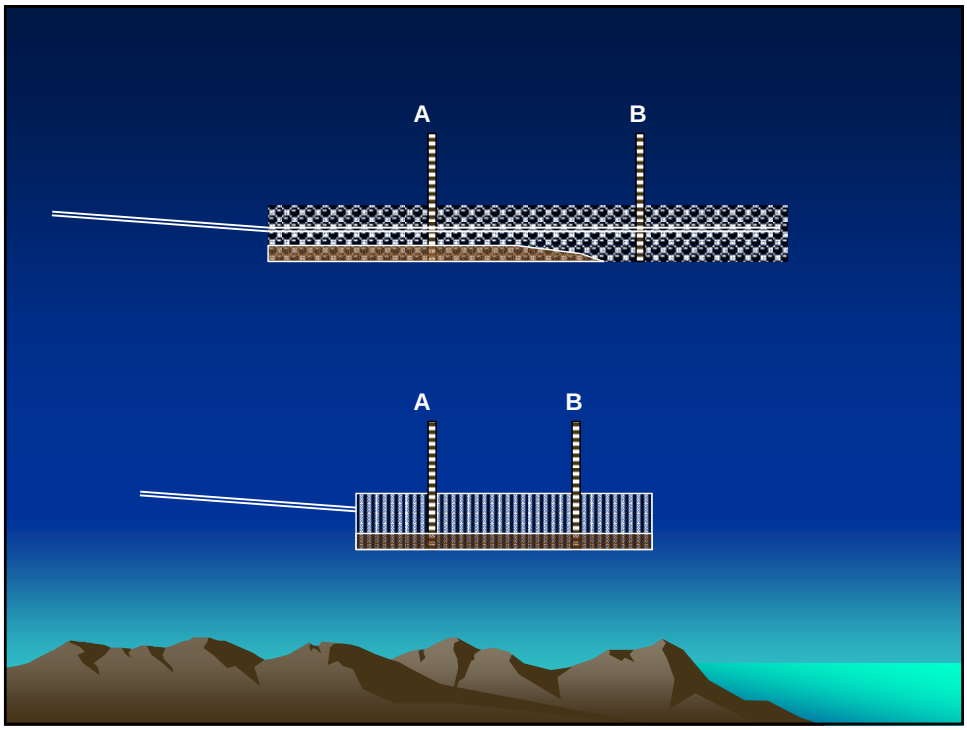
Gravelless Trenches Proximal Observation Ports



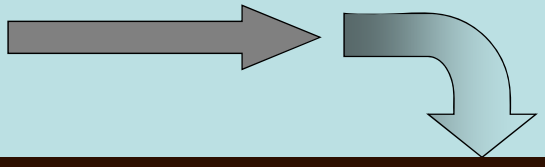
Gravelless Trenches Distal Observation Ports




Mean Ponding Heights
-all sampling ports-
Gravel Trenches Proximal
Gravel Trenches Distal
Gravelless Trenches Proximal
Gravelless Trenches Distal
Ponding Depth in mm
300
250
200
150
100
50
0
1 25 49 73 97 121 145 169 193 217 241 265 289 313 337 361
Days Past First Ponding Observation

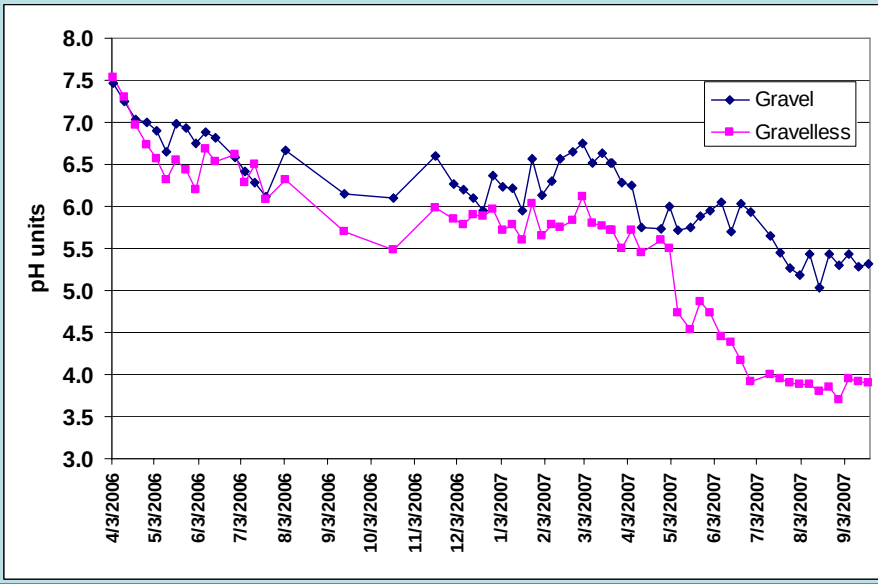

A
B
A
B

Percolate Samples

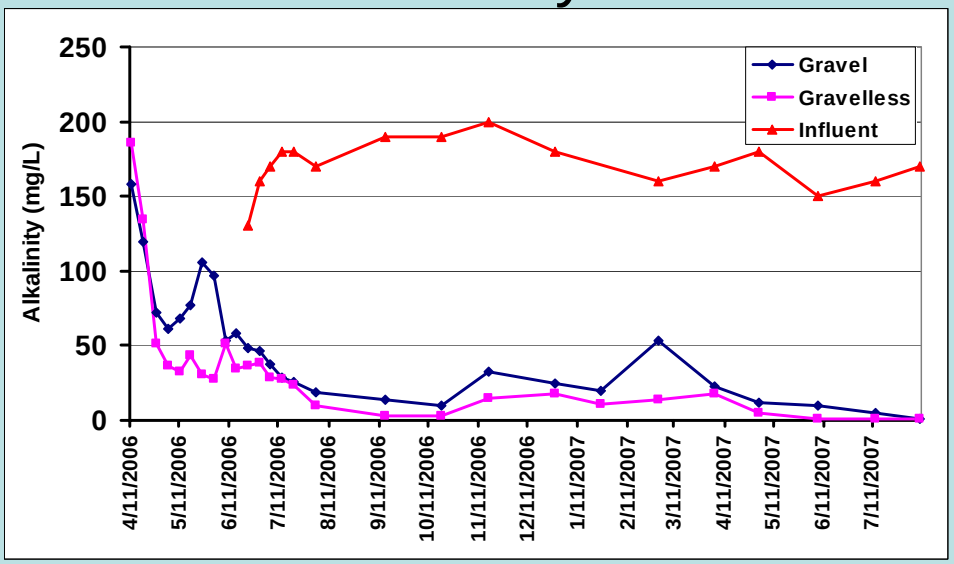


- pH
- Alkalinity
- Total Nitrogen
- Fecal Coliform

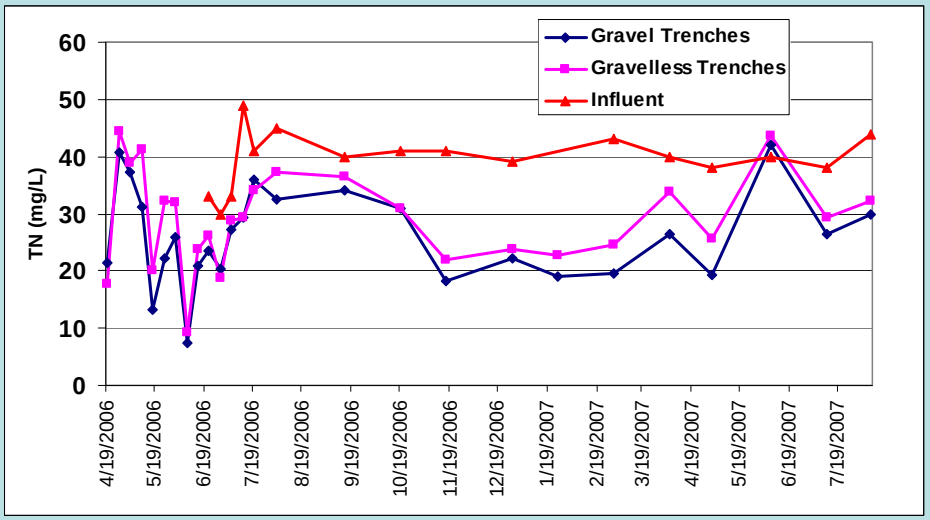
pH



Alkalinity

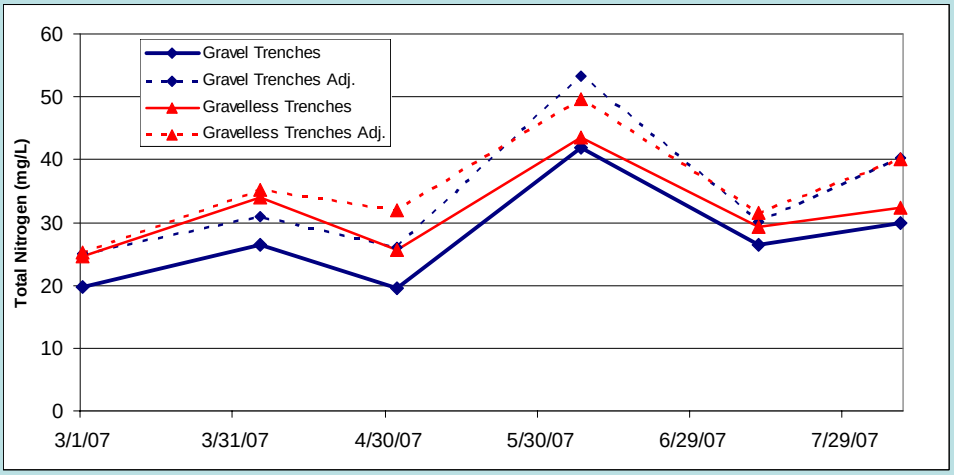


Total Nitrogen

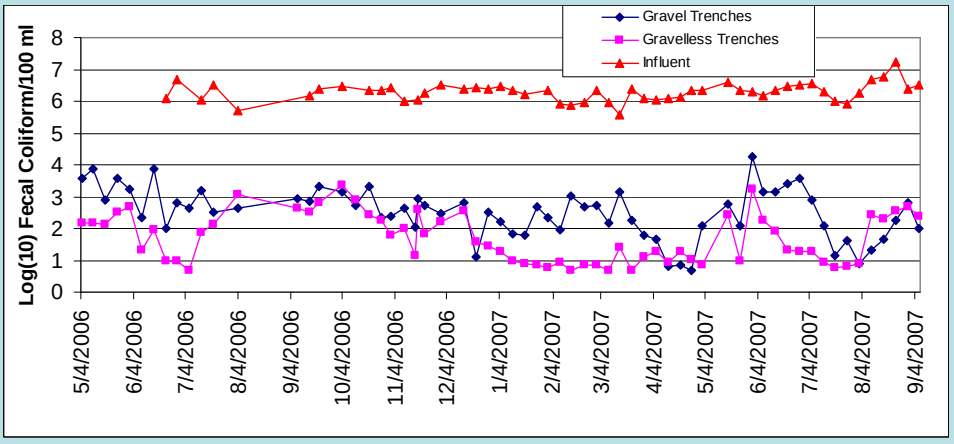


Total Nitrogen

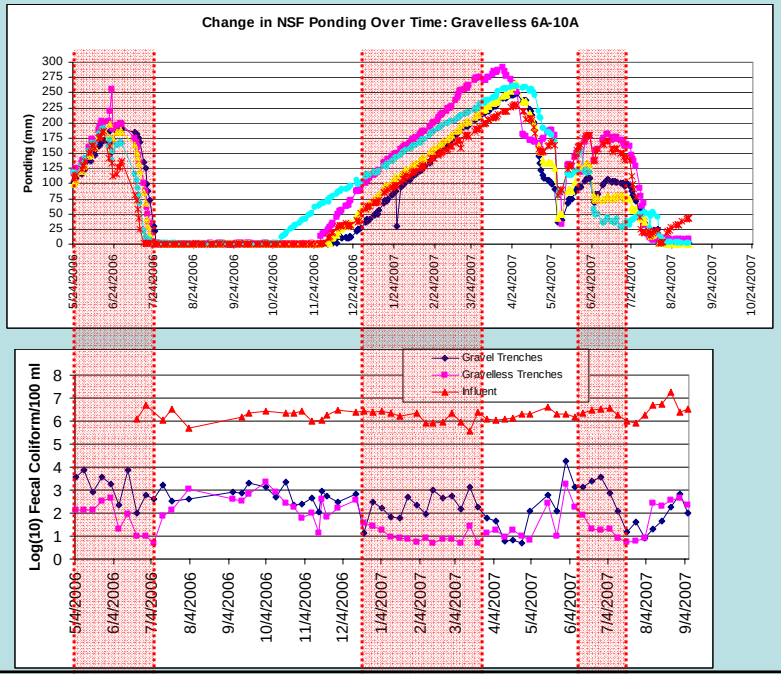
March 07 – August 07 Adjusted for Dilution



Fecal Coliform



FECAL COLIFORM COMPARED WITH PONDING LEVELS



Conclusion

There is no consensus among the National Sanitation Foundation's Standards Committee regarding the parameters that should be included in a standard test or the evaluation of a product.

What have we learned about standard septic system treatment?

- Standard gravel trenches exhibit ponding at the proximal end of the trench at elevations higher than the distal end.
- Nitrogen removal is 20-30%
- Fecal coliform removal is 3-4 logs (99.9-99.99%) after 2 ft of sand passage.
- Greatest fecal coliform removal appears correlated with ponding across the entire basal area.