NSF International

Onsite Wastewater Treatment Unit Program Standards, Testing and Certification

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About NSF International

- NSF's primary business activities are:
  - Developing national voluntary consensus standards that enhance public health and safety and protection of the environment.
  - Providing product certification services to manufacturers of products primarily in the food service, water treatment, plumbing, and wastewater treatment industries.
  - Providing management systems registration services.
  - Providing testing, auditing and consulting services.
  - Providing training and education services in the area of public health and safety.

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About NSF International

- ANSI accredited standards developer
- ANSI and SCC accredited certifier
- SCC accredited laboratories (17025)
- More than 20,000 clients in 100 countries
- 700+ employees, plus 500 auditors
- 150,000 square feet of state-of-the-art laboratories
- More than 200,000 tests per year

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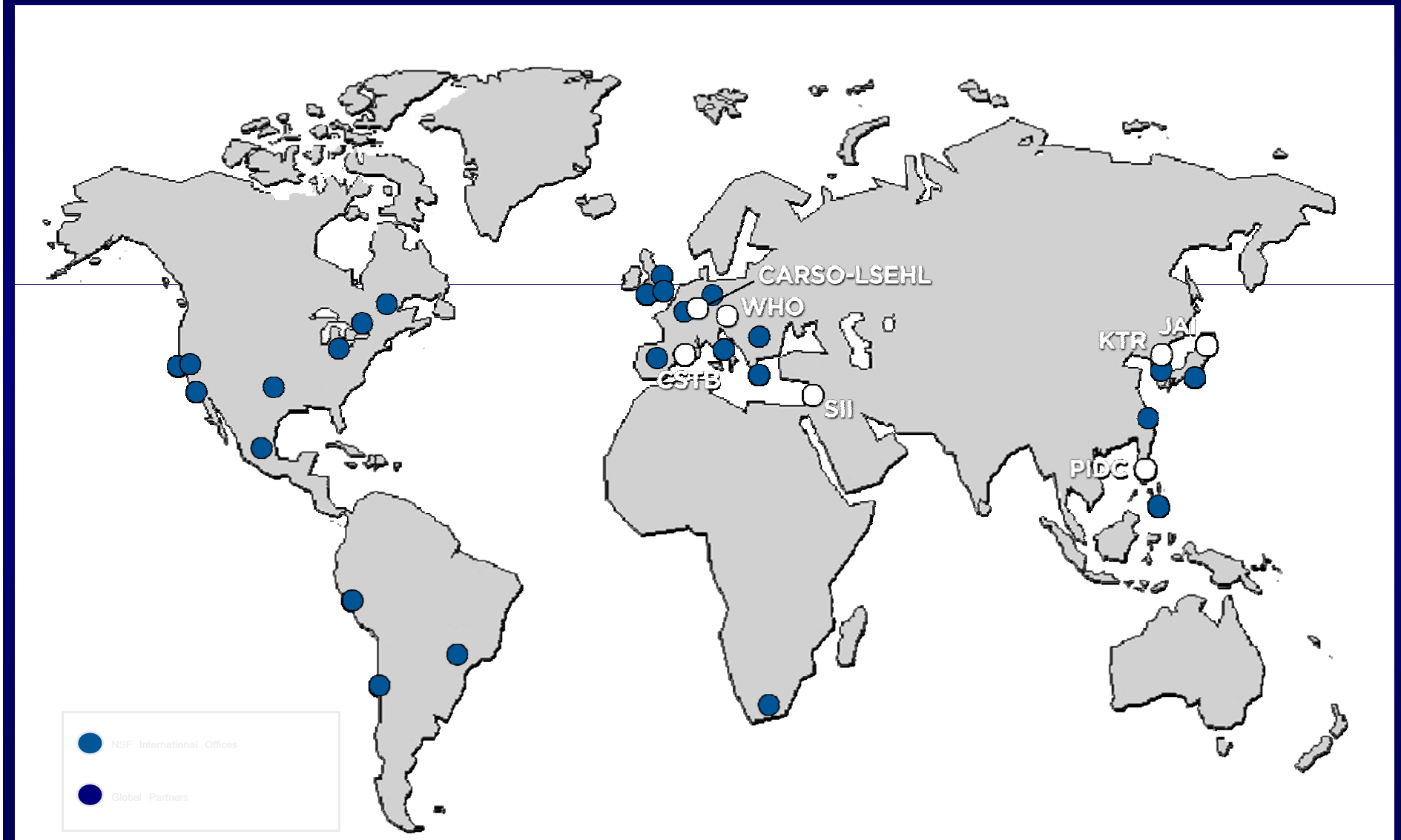
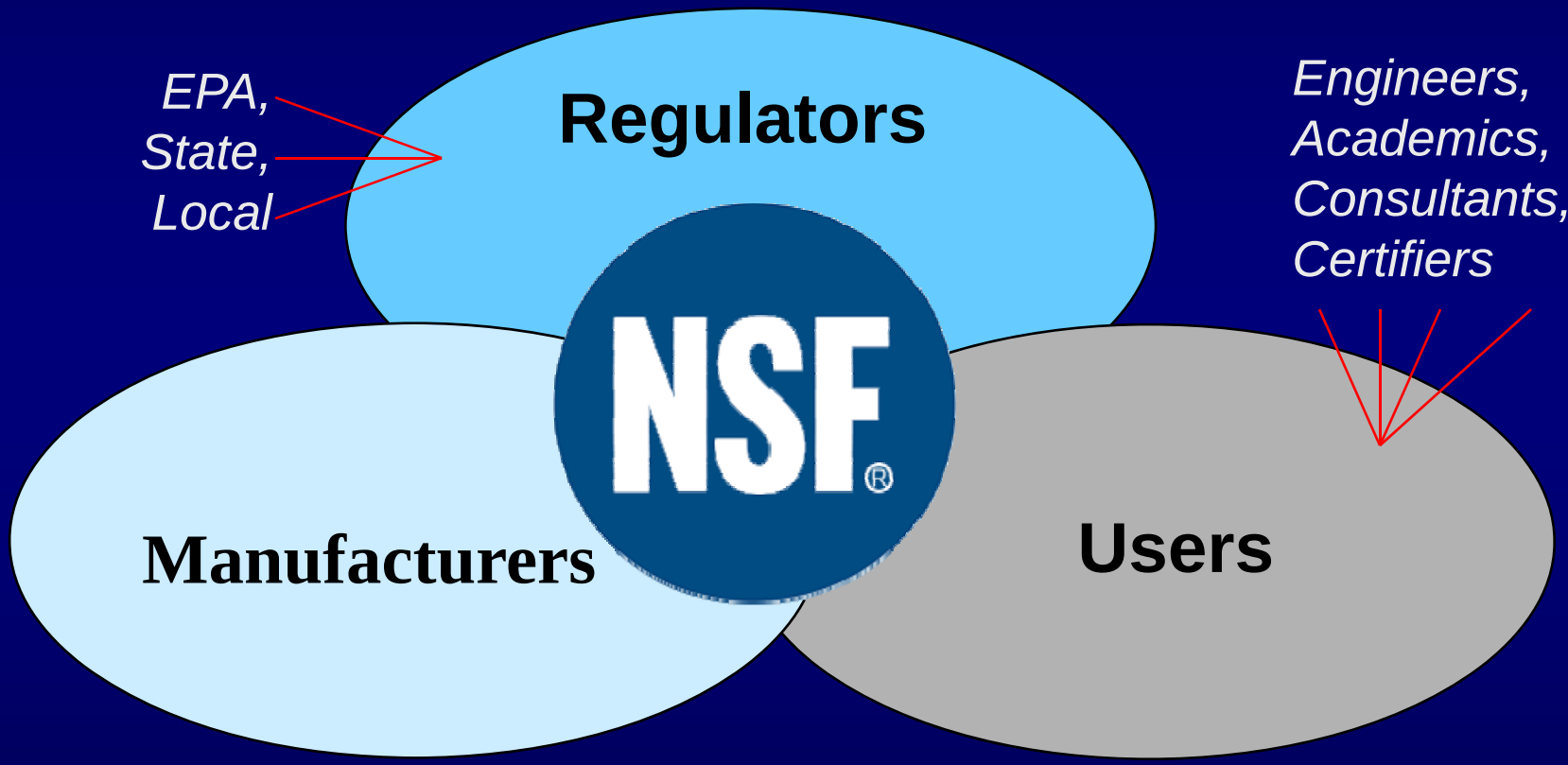
NSF Locations and Partners



Consensus Standards: Key to Success – Stakeholder Involvement



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NSF/ANSI Wastewater Standards

- Standard 40: Residential Wastewater Treatment Systems
- Standard 41: Non-Liquid Saturated Treatment Systems
- Standard 46: Evaluation of Components and Devices Used in Wastewater Treatment Systems
- Standard 245: Wastewater treatment systems – Nitrogen reduction

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NSF/ANSI Wastewater Product Standards

- Standard 41: *Non-Liquid Saturated Treatment Systems (compost toilets)*
- Standard 46: *Evaluation of Components and Devices Used in Wastewater Treatment Systems*
  - Septic tank filters
  - Pumps
  - Disinfection devices

NSF/ANSI Standard 40 and 245

- Scope 40: Any residential system with a treatment capacity of 400-1500 gpd; $CBOD_5$ and TSS reduction.
- Scope 245: Any residential system with a treatment capacity of 400-1500 gpd; Nitrogen reduction.
  - Must also meet the requirements of Standard 40 Class I effluent.

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NSF/ANSI Standard 40 and 245

- Infiltration and exfiltration resistance.
- Noise level; 60 dbA at 6m.
- Mechanical components; no periodic maintenance or adjustment.
- Electrical compliance with NEC.
- Ground level access ports for routine maintenance, sampling and examination.
- Failure sensing and signaling; audible and visual, detection of malfunctions.
- Data plate.
- Service label.
- Two-year limited warranty.

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NSF/ANSI Standard 40 and 245

- Product Literature
  - Owner's manual.
  - Installation manual.
  - Operation and maintenance manual.
  - Troubleshooting and repair manual.

NSF/ANSI Standard 40 and 245

- Performance Testing

- Installed per manufacturer's instructions.
- No restriction for seasons.
- Operated in accordance with manufacturer's instruction.
- No service or maintenance during entire six month test.
- All test data reported.
- No allowance for discard of any data, except if test facility fails to provide an acceptable test.

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NSF/ANSI Standard 40 and 245

- Design Loading of wastewater

  - 6:00 am to 9:00 am; 35%
  - 11:00 am to 2:00 pm; 25%
  - 5:00 pm t0 8:00 pm; 40%

Example: 500 gpd; Total of 80 doses over 24 hours, divided equally among three dosing periods (80 x 6.25 gallons)

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NSF/ANSI Standard 40 and 245

- Sampling
  - 24 hour composite
  - Standard 40: influent and effluent five days/week.
  - Standard 245: influent and effluent three days/week.

NSF/ANSI Standard 40/245

- Influent Wastewater Characteristics
  - BOD_5 100 mg/L - 300 mg/L
  - TSS 100 mg/L - 350 mg/L
  - TKN 35 mg/L – 70 mg/L
  - Alkalinity > 175 mg/L
  - Temperature 10 – 30°C (sampling suspended below 10°C)
  - pH 6.5 – 9

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NSF/ANSI Standard 40

- Effluent criteria: Class 1
  - $CBOD_5$ 25 mg/L 30-day average
    40 mg/L 7-day average
  - TSS 30 mg/L 30-day average
    45 mg/L 7-day average
- pH: 6.0 – 9.0
- All performance data reported

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NSF/ANSI Standard 245

- Effluent criteria (overall test average)
  - $CBOD_5$ 25 mg/L
  - TSS 30 mg/L
  - Total Nitrogen: minimum 50% reduction (design loading sample periods only – stress data reported)
  - pH: 6.0 – 9.0
- All performance data reported.

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Standard 40 and 245 Test Facilities

Test Sites/Laboratories:

- United States
  - Waco, Texas
  - Baton Rouge, Louisiana
  - Buzzards Bay, Massachusetts
- Canada
  - Vancouver, British Columbia
  - Quebec (BNQ)
- Europe
  - Aachen, Germany (PIA)

NSF Certification Process

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Requirements of NSF Certification Beyond Testing

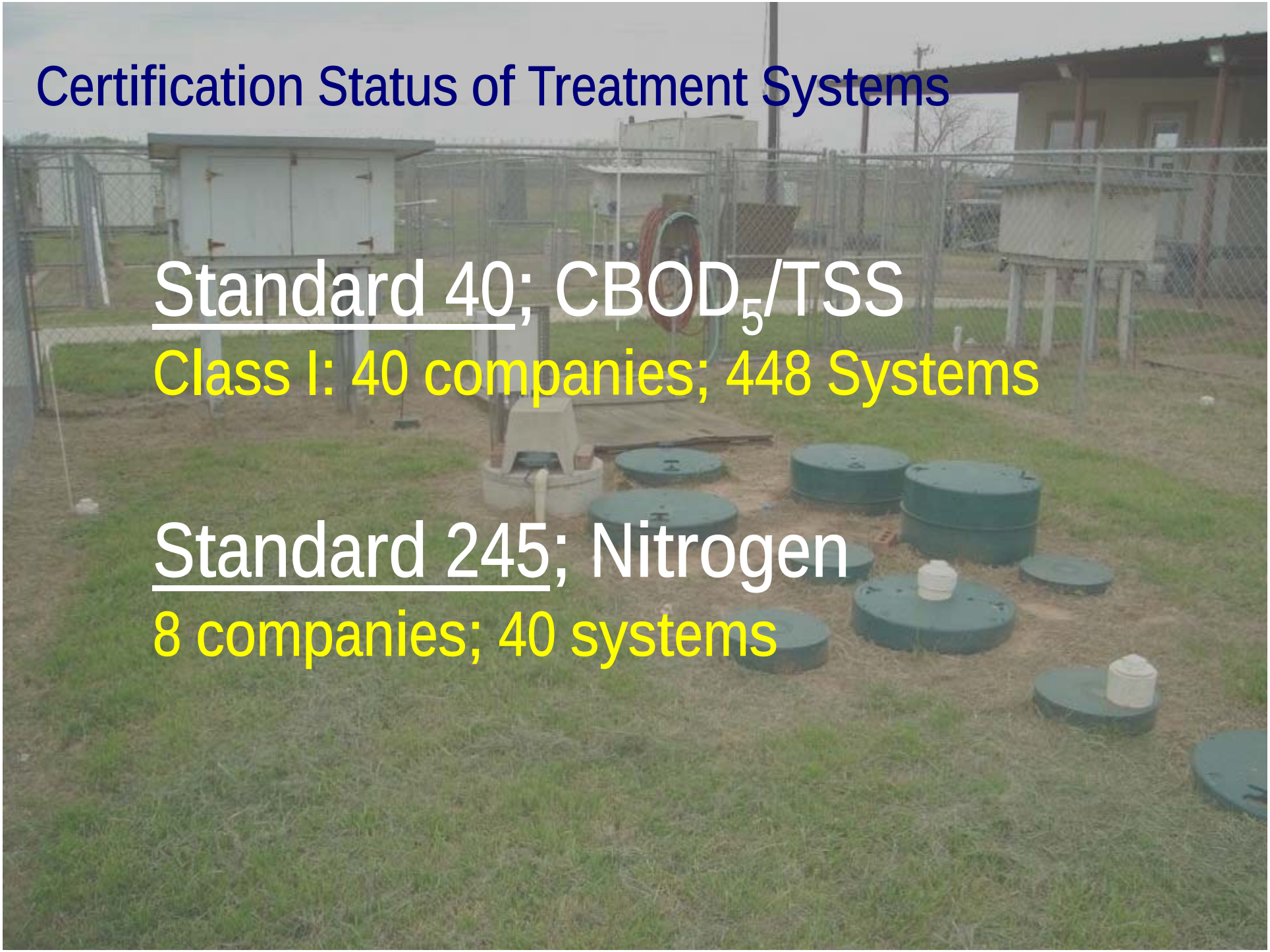
- Scale-up of tested product to larger systems based on proportionality
  - Allows certification of a family of models spanning a range of flows using a single test
- Review of all proposed modifications to tested and certified products
  - Engineering review
  - Testing, if necessary
- Annual audits
- Service related obligations

Annual Audits

- Annual Manufacturing Facility Audits:
  - Focus on proper product specifications.
  - Annual, unannounced audit of all production locations.
- Annual Service/Maintenance Provider Audits:
  - Focus on service obligations.
  - Minimum four inspections/year by NSF, including three installations for each distributor inspection.

Service Related Obligations

- Two-year initial service policy with purchase
  - Four site visits.
- Extended policy available for fee.
- Stand-by parts in stock.
- Service within 48 hours.



Certification Status of Treatment Systems

Standard 40; $CBOD_5$/TSS

Class I: 40 companies; 448 Systems

Standard 245; Nitrogen

8 companies; 40 systems

Three New Draft Standards

- NSF/ANSI 240 *Drainfield Product Trench Sizing for Gravity Dispersal Onsite Wastewater Treatment Systems*
- NSF/ANSI 350 *Onsite Residential and Commercial Reuse Treatment Systems*
- NSF/ANSI 360 *Field Performance Verification*

NSF 240; Drainfield Trench Product Sizing for Gravity Dispersal Systems

- Alternatives to conventional course aggregate dispersal systems
- Hydraulic performance (gpd/sqft)

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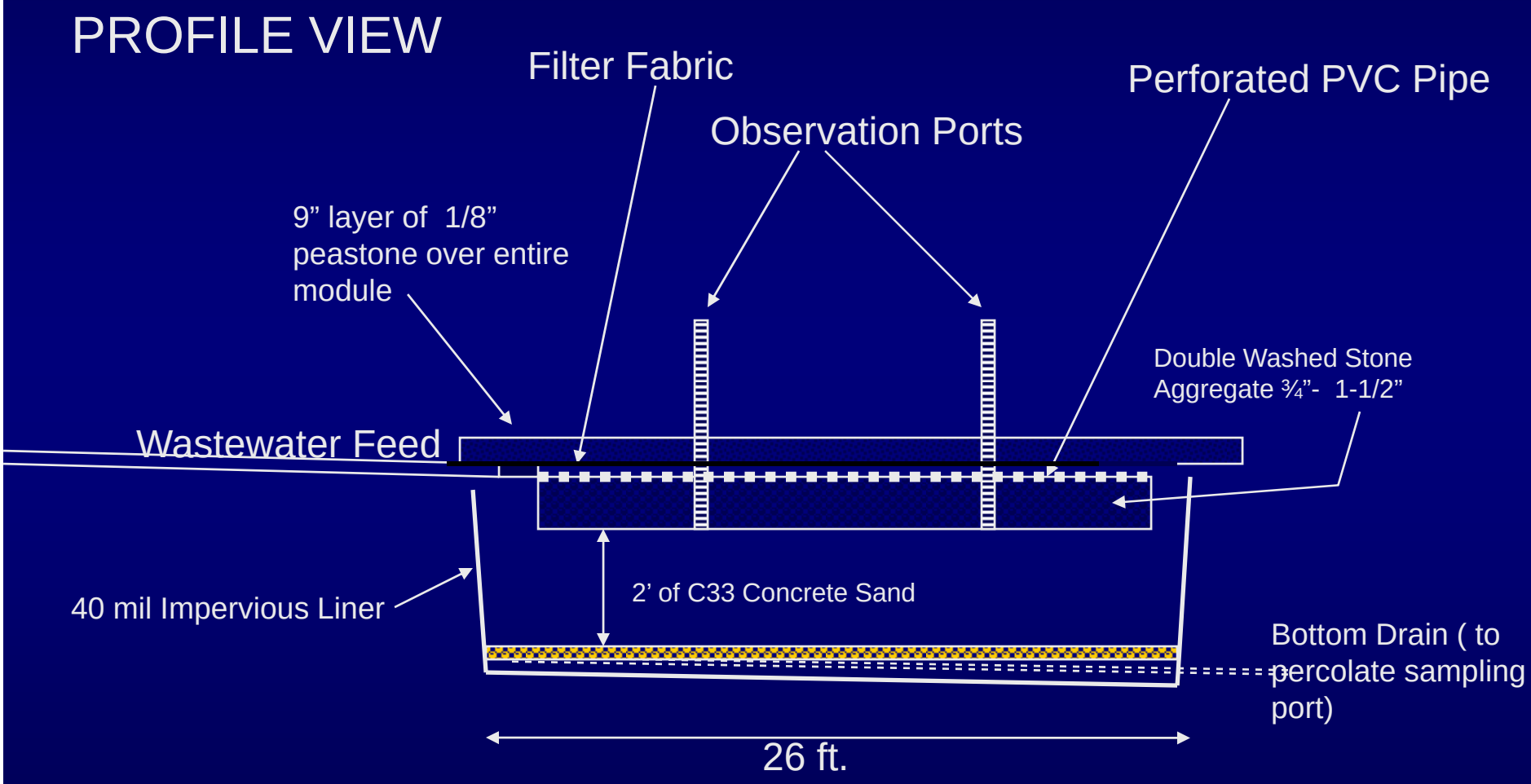
Drainfield Testing; Two methods

- Long Term Acceptance Rate (LTAR)
  - Newer technologies
  - Test site evaluation
- Field Sizing Adjustment (FSA)
  - Products in general use for 10 years or more; minimum 1000 systems
  - Expert panel review of field studies

Long Term Acceptance Rate

- Equal number of aggregate control versus trench product; six of each
- All of equal length; 12 foot minimum
- Width can be varied 1-4 feet
- Loaded with residential wastewater
  - Same as Standard 40 for strength
  - Septic tank effluent
- Minimum 36 week test
  - Accelerated loading to achieve ponding

LTAR Test Cell



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LTAR Performance Evaluation

- Assessment of hydraulic acceptance
- Increase, decrease or same compared to control
  - Gallons of effluent passing through trench divided by time (gpd).
  - gpd flow rate divided by the square foot of trench bottom area.
  - Geometric mean of each replicate data set.
  - Reported as “X”% smaller sizing than control (to nearest 5%)

Field Sizing Adjustment

- Expert panel
- Review of existing data sets
- Judged by study type and data quality attributes; scoring system
  - Type; third-party vs. manufacturer led, and if compared against control, trench product only, permit data only
  - Data quality; performance, age of systems, soil condition, climate, peer review

Data quality attribute	Sub attribute	Group score	Subgroup weight
Performance	Statistical measure of sample size mean failure rates and statistical confidence levels	40	
	Means and test of significance or confidence intervals are reported at 95% level or greater		40
	Means and test of significance or confidence intervals are reported at 90 to 94% level		30
	Means and sample size per treatment but no significance test or confidence intervals are reported		10
	Sample size less than 20		5
Age of systems		30	
	50% of sites installed more than 20 years earlier		30
	50% of sites installed between 5 and 20 years earlier		25
	50% of sites installed less than 5 years earlier		20
	50% of sites installed less than 2 years earlier		10

Example Individual FPA Scoring - 3rd Party, Perfect Execution and Results			
Data Quality Attribute	Ranking of FPA (From Table 1)	DQA Score (from Table 2)	Total Score
Performance Assessment	1.00	40	40.00
Age of Systems	1.00	30	30.00
Soil Conditions	1.00	10	10.00
Climate	1.00	10	10.00
Peer Review	1.00	10	10.00
		Measurement End Score	**100.00**

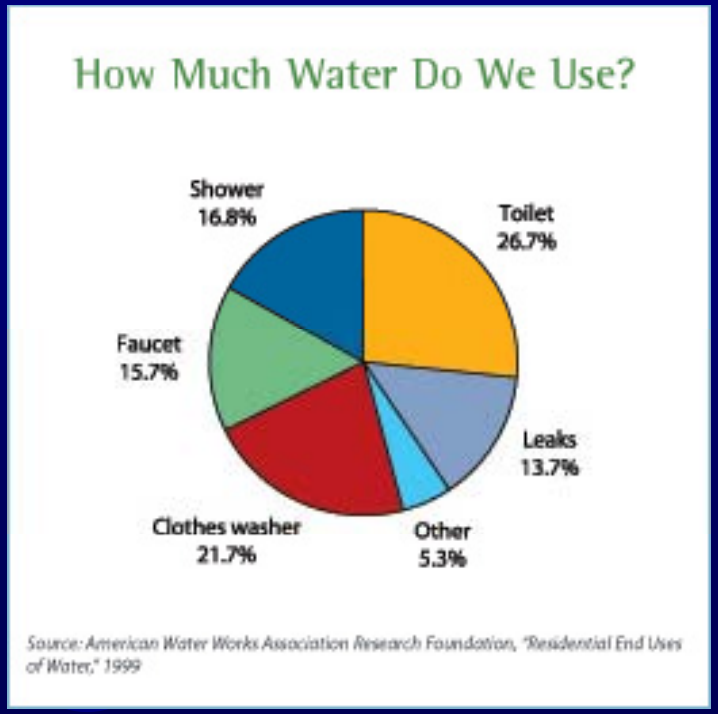
Example Individual FPA Scoring - 1st Party, Lesser Execution and Results			
Data Quality Attribute	Ranking of FPA (From Table 1)	DQA Score (from Table 2)	Total Score
Performance Assessment	0.23	20	4.60
Age of Systems	0.23	20	4.60
Soil Conditions	0.23	4	0.92
Climate	0.23	8	1.84
Peer Review	0.23	1	0.23
		Measurement End Score	**12.19**

Field Sizing Adjustment

- Very few companies expected to have sufficient studies to qualify.
- Established for those with substantial data already, alleviating cost and time of further controlled testing.
- Most products will undergo controlled testing (LTAR).

NSF 350 Onsite Residential and Commercial Reuse Treatment Systems

- Increasing need as potable water becomes a more precious resource.
- Increasing interest as we enter the age of green/sustainability.
  - LEED Credits



Research To-date; Existing Standards, Regulations, Guidelines

- US:
  - Arizona
  - Florida
  - California
  - Georgia
  - Hawaii
  - Illinois
  - Massachusetts
  - New Jersey
  - Oregon
  - Washington
  - Wisconsin
  - USEPA
  - NOWRA
- Canada:
  - CMHC
  - Alberta
  - British Columbia
  - Manitoba
  - Prince Edward Island
  - Saskatchewan
- Australia
- China
- Germany
- Japan
- Korea
- WHO

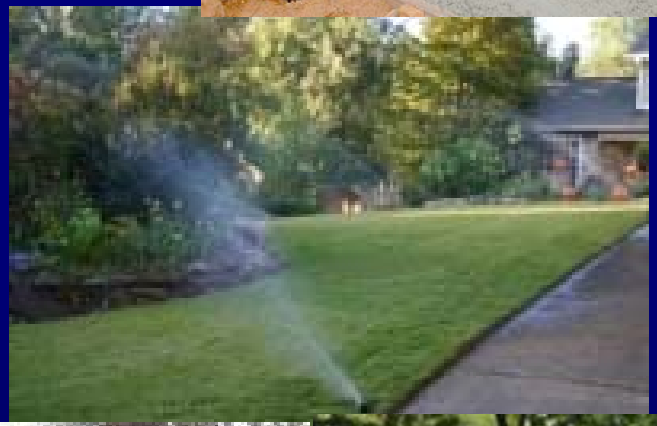
Broad Scope of Water Sources

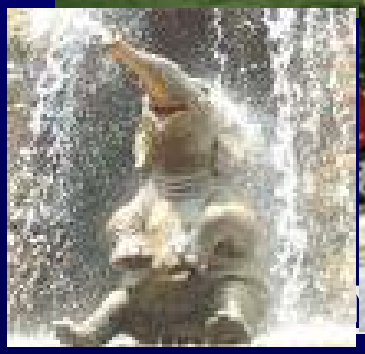
Multiple Sources

- Nature generated
  - Rainfall
  - Storm runoff
- Human generated
  - Graywater
  - Residential wastewater

Broad Scope of Reuse Applications

- Use of treated effluent:
  - Irrigation
  - Toilet/urinal flushing
  - Vehicle washing
  - Fire protection
  - Laundry
  - Fountains
  - Dust control
  - Construction





Current Draft

- Residential and commercial treatment systems
- Sources; graywater and residential wastewater
  - Graywater is laundry and bathing
- Effluent application
  - Indoor restricted urban use; toilet and urinal flushing
  - Outdoor unrestricted urban use; surface and subsurface irrigation

Scope of System Sizes

- Graywater; 100-1500 gpd
- Residential wastewater; 400-1500 gpd
- Systems exceeding 1500 gpd; as field evaluation, not standardized test

Overall Standard

- Comparable in many ways to Standards 40 and 245
  - Access ports
  - Failure sensing and signaling
  - Product literature
  - Performance evaluation

Performance Evaluation

- Residential wastewater treatment system; same as Standard 40/245
  - Standard 40 Class I and 245 prerequisite
  - Additional effluent sampling for turbidity and E. coli

Performance Evaluation

- Graywater treatment system
  - Synthetic wastewater challenge to mimic laundry and bathing waters
  - Dosing regiment same as 40/245
  - Similar stress events, except adding cleaning chemical stress
  - Duration minimum of six months
    - No service or maintenance
  - Sampling 3 days/week

Graywater Influent Characteristics

Parameter	Required range
TSS	60-80 mg/L
$CBOD_5$	130-180 mg/L
Temperature	25-35°C
pH	6.5-8.0
Turbidity	50-70 NTU
Total phosphorous	10-20 mg/L
Total nitrogen	3.0-5.0 mg/L
Total coliforms	10^3-10^4 CFU/100mL
E. coli	10^2-10^3 CFU/100mL

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Effluent Criteria (all)

Parameter	Class R	Class C
$CBOD_5$	10 mg/L (25)	10 mg/L (25)
TSS	10 mg/L (30)	10 mg/L (30)
Turbidity	5 NTU (10)	2 NTU (5)
E. coli	14 MPN/100 mL (240)	2.2 MPN/100 mL (200)
pH	6.5-8.5	6.5-8.5

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NSF 360 Field Performance Verification

- Same systems as covered under Standards 40/245
- Goal: Bridging lab versus field performance

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Why the Need for a Standard?

- Concerns for performance of certified systems in the field
  - Many past studies had poor design and invalid data leading to improper conclusions
- States requiring field evaluations of certified systems
  - Additional measure of approval
  - Potential for multiple studies

NSF 360 Field Performance Verification

- Field evaluation of 20 systems minimum
  - Selected from a minimum pool of 100.
  - Minimum of six months in operation.
  - Sampled quarterly for one year; minimum of 80 total sample points.
  - Sampled for $CBOD_5$ and TSS, and other parameters at the discretion of the manufacturer, or as required of the regulatory authority.
  - Suggested sampling across a diversity of locations, but no mandate that it be done in more than one state or region.
  - All oversight, sampling and analysis managed by a third-party organization, such as NSF.

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NSF 360 Field Performance Verification

- Not a requirement of 40/245 certification.
- Not a pass/fail evaluation, but detailed report will be produced.
- Only systems having already met the requirements of NSF/ANSI Standard 40, Class I (Standard 245 if sampling TN).

THE ONSITE WASTEWATER MONITOR

An NSF International Publication for the Wastewater Treatment Community

SEPTEMBER 2009

Welcome to the latest issue of *The Onsite Wastewater Monitor*. This e-newsletter is provided by NSF International to keep you informed about NSF's onsite wastewater program, including standards development, testing and certification, conferences, trade shows and regulatory issues.

Be sure to look for the next issue in November!

NEWS:

NSF Protocols: A Unique Alternative to Standards

American National Standards, such as NSF/ANSI Standards 40 and 245, are often the desired option when developing test methods and criteria for evaluating products. Such standards undertake a formal, accredited process of committee development, public comment and balloting, leading to the establishment of a single, national standard. There are times, however, when development of a national standard may not be the best alternative. This can often be true for smaller markets that have only one or a few manufacturers. In the case of very small markets, particularly for unique technologies that fall outside existing standards, NSF provides the alternative of NSF Protocols.

Much like traditional NSF Standards, protocols are developed

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