

DRAFT

Field Verification Test Plan Application Template Chesapeake Bay Watershed States

This document is a template to be used by applicants seeking approval of onsite septic systems that provide nitrogen treatment in states within the Chesapeake Bay Watershed. The focus is on nitrogen reduction as nitrogen is a critical nutrient impacting water quality within Chesapeake Bay. The Test Plan template is only for field verification of treatment systems with rated capacities between 400 – 1500 gallons/day, and does not include soil-based treatment systems.

An applicant will submit a Test Plan, based on the template, in accordance with each state's approval program. The Test Plan template is based on the template for NSF/ANSI 360 (2010). The sampling procedure outlined in this document is for field verification testing. It assumes that initial data collection for the system performance has been completed and that the system is approved for field verification in the states where final approval is requested.

This template describes specific data collection protocols required by all of the Chesapeake Bay Watershed States. The application will be reviewed by the states, who will either: 1) approve the Test Plan and allow field verification testing to begin, 2) request changes to the Test Plan prior to approval, or 3) deny the request for field verification if the Test Plan does not meet the requirements to move forward.

Each state has individual performance standards that must be met to receive approval for general use of an advanced onsite system. General approval of the product is not guaranteed and is subject to review by each state. The applicant should recognize that there may be some risk when installing systems in a state, such as Maryland, that may allow installation of products prior to general approval. Applicants should review the performance standards in each state, where they would like to receive approval, to fully understand the level of system performance required for approval.

Directions

This Test Plan template is designed to clearly describe the data collection requirements to be included in the field verification testing. Some states may have additional submission requirements that the applicant will need to verify. It is the responsibility of the applicant to complete the Test Plan application according to this template; along with any additional state(s) requirements.

Italicized text in this Test Plan indicates requirements specific to the Chesapeake Bay Watershed States, while the non-italicized text is adopted from NSF/ANSI Standard 360. The Test Plan application must comply with all the requirements, including those in italics. The applicant is to submit the Test Plan to each state in this agreement, regardless if they are requesting approval in every state.

DRAFT

Field Verification Test Plan for
System Name
System Model and Model Number
Applicant Name

Section 1

1.1 Test Plan Approval

Verification Organization – Representative Name

Title

Verification Organization Representative– Signature

Date

Testing Organization – Representative Name

Title

Testing Organization Representative – Signature

Date

Applicant – Representative Name

Title

Applicant – Signature

Date

Section 2 Project Description and Objectives

2.1 Project Description

The Test Plan shall provide a description of the project, an overview of the testing to be performed, the test objectives, and *any previous certifications (e.g., NSF 40/245). The applicant must identify the model that will be used in the test population and the associated design flow.*

2.2 Project Objectives

Identification of critical measurements, data quality objectives, data quality indicator goals, the schedule for completing testing, and milestones shall be addressed. *The applicant is to include expected product field performance based on previous data collection.*

Additionally, the applicant will be required to make a presentation regarding their application to the Chesapeake Bay States before the Test Plan is approved. The presentation will most likely be in the form of a webinar, so that all states can be involved.

Section 3 Project Organization

3.1 Key Project Contacts

The Chesapeake Bay States have chosen NSF International as an acceptable verification organization. An applicant may propose another organization for review and approval by the states. Only one verification organization should be used for all systems tested under this application. A state may also conduct their own independent review of the data collected during field testing.

Table 1: Project Contacts

Verification Organization	Name
Contact Person Name	Phone Number: Address: Email Address:
Testing Organization	Name
Contact Person Name	Phone Number: Address: Email Address:
Applicant	Name
Contact Person Name	Phone Number: Address: Email Address:

3.2 Chesapeake Bay States Contact Information

Questions on test plan template or the approval process in each state can be addressed to the contacts provided in Table 2 below.

Table 2. State Agency Contacts

State	Name	Phone	Email
DE	Dave Schepens	(303) 739-4762	Dave.Schepens@state.de.us
MD	Jay Prager	(410) 537-3599	Jay.Prager@maryland.gov
NY	Ben Pierson (DOH) Thomas Boekeloo (DEC)	(518) 402-7650 (518) 402-8243	Ben.Pierson@health.ny.gov thboekel@gw.dec.state.ny.us
PA	John Diehl, P.G.	(717) 783-2941	jdiehl@pa.gov
VA	Marcia Degen	(804) 387-1883	Marcia.Degen@vdh.virginia.gov
WV	Rick Hertges	(304) 356-4340	Rick.A.Hertges@wv.gov

3.3 State Approval Request

In the table below, indicate the state(s) in which the applicant is requesting system approval. Some states require that a certain amount of units be field tested in-state. Please indicate the proposed number of units to be installed in the states where approval is sought.

Documentation of the performance of the system according to the Initial Data Collection Protocols agreed to by the Chesapeake Bay states should also be provided. These protocols are based on NSF Standard 245 with some additional information required. Some system may have received initial or provisional approval prior to the adoption of the initial data collection protocols. In those cases, the approval documentation should also be submitted so each state can confirm the proposed system is eligible to proceed to the field verification stage. For example Pennsylvania requires initial performance data to be developed in accordance with NSF Standard 245. Where available, provide the date for which each state gave approval of the initial data submitted in Table 3 below.

Table 3: Summary of Requested Approvals

State	Date of pre-approval of initial data	Units installed in-state		Approval Requested
		Required	Proposed	
Delaware		0		
Maryland		6		
Pennsylvania		6		
Virginia		0		
West Virginia		0		
New York		N/A*		

* While New York State is supportive of the data sharing efforts across the Chesapeake Bay Watershed states, the current number of nitrate removing residential or small private/commercial/institutional systems in New York State is very limited. As a result, New York State chooses not to participate in requiring a field verification test plan at this time. Both the New York State Department of Health and New York State Department of Environmental Conservation request that they be kept up to date on the progress of this project and similar data-sharing opportunities.”

3.4 Location of Installed Units

The table in Appendix A is to be used by the applicant to submit the locations for the units to be tested during field verification with the following requirements:

- *20 sites must be submitted by the applicant for review and approval by all states where approval is sought;*
- *15 sites will be selected, with a minimum of 12 units to be tested and 3 sites to remain as reserves. More sampling and reserve sites can be approved if the manufacturer has a reason to test additional sites; and*
- *At least 25% of the total tested units must be installed at locations underlain by a non-carbonaceous geologic formation.*

States do not require field test locations until the Test Plan is approved. The applicant must submit this information prior to sampling and is subject to approval by the states. Site identification labels should include the state abbreviation for which the site is located. The table must include the following information:

- Site location (street address, town, county, state)
- Occupancy
- Property owner contact information
- Any stipulations on access to the treatment system

Copies of all signed homeowner permissions to enter the property should be attached to this plan. *This information is required to be submitted after the Test Plan is approved and prior to sampling. Due to the potential complications of finding appropriate locations, the list provided in Appendix A can be reviewed and updated as needed.*

Section 4 Experimental Approach

4.1 Sampling Points

Describe the sampling/monitoring points for all measurements, including locations and access points.

4.2 Frequency and Number of Samples

The Test Plan shall include the frequency of sampling/monitoring events, as well as the number of each sample type and/or location, including QC and reserve samples. The sampling strategy and procedures shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting verification objectives.

Sampling shall include, at a minimum:

- *Sampling on an individual unit will not begin until the unit has operated continuously for at least three consecutive months.*
- *Effluent samples will be 24 hour time composite samples. Influent samples will not be collected; however, an assumed default value of 60 mg/L of total nitrogen is used.*
- *Samples will be collected once per quarter for four consecutive quarters at each field site. One sample per site will be taken between December 15 and March 15, to be representative of cold weather samples. A minimum of 45 days between sample events at each site is required. Only four samples per site can be taken without preapproval. The applicant has a maximum of three years from the Test Plan approval date to complete the*

testing program and submit all required deliverables without preapproval from the states.

4.3 Data Measurements

All measurements shall be identified for each sample type, and test-specific target analytes shall be listed and classified as critical or non-critical in the Test Plan.

Measurements to be conducted on effluent samples include CBOD₅, TSS, DO, pH, NO₂, NO₃, TKN, ammonia-N, total-nitrogen, and alkalinity. Wastewater temperature and ambient air temperature will also be recorded. For purposes of evaluating the nitrogen treatment performance of a system it will be assumed that the influent nitrogen concentration to the treatment system will be 60 mg/L.

Additionally, an estimate of influent flow shall be included based on the site's water bill. If no water bill is available, the pump event counter or telemetry system can be used to estimate the flow. If no counter is available through the system, an assumed occupancy flow estimate of 45 gallons/person/day shall be used.

The samples collected shall be analyzed as shown in Table 4.

Table 4: Sampling Summary

Parameter	Sample Type	Testing Location
CBOD ₅	24 h composite	Laboratory
Total suspended solids	24 h composite	Laboratory
pH	Grab	Test site
Temperature (wastewater)	Grab	Test site
Temperature (ambient air)	Grab	Test site
Dissolved Oxygen	Grab	Test site
Alkalinity (as CaCO ₃)	24 h composite	Laboratory
TKN (as N)	24 h composite	Laboratory
Ammonia-N (as N)	24 h composite	Laboratory
Nitrite-N (as N)	24 h composite	Laboratory
Nitrate-N (as N)	24 h composite	Laboratory

4.4 Data Evaluation

The planned approach (statistical and/or non-statistical) for evaluating data, including formulas, units, and definitions of terms, shall be included in the Test Plan, *and be in accordance with NSF 360 Section 8: Statistical evaluation of data. The statistical data analysis shall include at a minimum:*

- *Median;*
- *Mean;*
- *Standard Deviation;*
- *Variance “within” and “between” sites; and*
- *Percent Exceedance Curve, with all data.*

The effluent data will be evaluated separately by each state based on their state performance standards for system approval. If the system is determined to not be performing as expected, the state has the authority to revoke approval for additional product construction.

4.5 Safety and Hygiene Plans

The Test Plan shall include or reference safety and hygiene plans for the relevant testing organization and laboratory.

Section 5 Sampling Procedures

5.1 Site Evaluation and Factors

Site evaluation shall include general site description such as access to system, access to outlet, power availability, security, site drawings and photos, and installation instructions and details. The Test Plan shall identify known site-specific factors that may affect sampling/monitoring procedures.

Notes will be made in the field log book to record any site conditions that could impact operation of the system or collection of samples, such as the number of residents in the home, changes in resident conditions that could impact system operation (such as medications), mechanical or electrical problems with the system, etc.

5.2 Site Preparation

Any site preparation needed prior to sampling/monitoring shall be described in the Test Plan.

5.3 Sampling Procedure

Each sampling/monitoring procedure to be used shall be discussed or referenced in the Test Plan.

5.4 Representative Samples

The Test Plan shall include discussion of the procedures to be used to assure that representative samples are collected.

5.5 Sample Volumes

A list of sample volumes to be collected and the amount of sample required for each analysis, including QC sample analysis, shall be specified in the Test Plan. *Information on sample volumes should be provided in a table similar to the example provided in Appendix B.*

5.6 Split Samples

For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the Test Plan shall identify who is responsible for splitting samples and where the splitting is performed.

5.7 Sample Containers and Preservation Methods

Sample containers and preservation methods (i.e., refrigeration, acidification, etc.) including specific reagents, equipment, and supplies required for sample preservation shall be described in the Test Plan. *Information on sample preservation should be provided in a table similar to the example provided in Appendix B.*

5.8 Hold Time Requirements

Hold time requirements shall be specified in the Test Plan *and provided in a table similar to the example provided in Appendix B.*

5.9 Sample Transportation

Procedures for transporting samples shall be described in the Test Plan.

5.10 Sample Archiving

Sample archiving requirements, or sample retention policies, for the organizations conducting the sampling and analysis shall be provided in the Test Plan.

Section 6 System Operation and Maintenance

The system Operation and Maintenance manual should be attached to the Test Plan.

6.1 System Operation

Each unit will be operated under residential use and occupied by at least two people for the duration of the study. Should a system initially identified for testing be found during testing to be unqualified, the results from a reserve system may be substituted for the unqualified system with state approval. Changes in occupancy or the manner of use, which occur over the period of field evaluation occurs, shall be noted. Intermittent periods of time with a lower to no occupancy shall not be considered as disqualifying but shall be recorded in the field log book and reported in the final report.

6.2 System Maintenance

All units must be operated under a valid maintenance agreement or contract, or in accordance with the system O&M manual and any state requirements, and shall extend through the period covering the final sample collection. System inspections shall be conducted according to both the applicant specifications and state requirements. At a minimum, inspections will occur twice per year. No maintenance will be performed on the unit outside the routine maintenance. Any maintenance conducted on the unit cannot be done on the same day as sampling. The system maintenance provider shall be independent of the testing organization.

6.3 Field Log Book

A log will be kept to include any observations during the duration of field testing. All maintenance performed on the unit will be recorded in the field log book and submitted along with the other deliverables. Additionally, any changes in operation or disruptions to sampling will be described in the log book.

Section 7 Analytical Procedures

Sample analysis will be conducted using an appropriate EPA method or method in Standard Methods for the Examination of Water and Wastewater.

7.1 Measurement Methods

Each measurement method to be used shall be described in detail or referenced in the Test Plan. Where appropriate, modifications to EPA approved or similarly validated methods shall be specified. Methods shall be appropriate to the matrix/analyte being tested. *Details on the sample methods, and accuracy and precision criteria for the analytical methods should be provided in a manner similar to the example provided in Appendix C.*

7.2 Calibration Procedures

For measurements requiring a calibrated system, the Test Plan shall include specific calibration procedures applicable to each target analyte, and the procedures for verifying both initial and continuing calibrations (including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

Section 8 Quality Assurance Project Plan (QAPP)

The applicant is responsible for submitting a QAPP that follows the guidelines in NSF 360 Section 7: Quality Assurance/Quality Control. The QAPP shall be attached to this Test Plan and address the following points:

- Procedures to maintain chain-of-custody (e.g., custody seals, records) during sample transfer from the field to the laboratory, in the laboratory, among contractors, and subcontractors shall be described in the QAPP to ensure that sample integrity is maintained.
- The QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.
- Any additional test-specific QA objectives shall be presented in the QAPP, including acceptance criteria. This includes items such as mass balance requirements.
- The specific procedures used to assess all identified QA objectives shall be fully described in the QAPP.
- The QAPP shall list and define all other QC checks and/or procedures (i.e., blanks, surrogates, controls, etc.) used for the verification testing, both field and laboratory.
- For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed, if acceptance criteria are not met, shall be included in the QAPP.
- The QAPP shall describe how the sampling equipment is calibrated and the frequency of calibration.
- The QAPP shall describe how cross-contamination between samples is avoided.
- All QA Managers and their relationship in the organizations (i.e. location within each organization) shall be identified in the QAPP with evidence that the QA Manager is independent of project management.
- Responsibilities of all other project participants shall be identified in the QAPP, meaning that organizations responsible for planning, coordination, sample collection, sample custody, measurements (i.e. chemical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified in the QAPP.
- Any change from the approved plan, in sampling procedure, must be approved in advance by the states where approval is being requested.
- All treatment units being sampled must be designed, installed and configured precisely as the treatment units that received initial approval.

Section 9 Data Reporting and Data Reduction

9.1 Data Reporting Requirements

The reporting requirements (e.g., units, method) for each measurement and matrix shall be identified in the Test Plan.

9.2 Expected Deliverables

The deliverables expected from each organization responsible for field and laboratory activities shall be listed in the Test Plan. *The data shall be provided in Microsoft Excel format. The Field Log Book must be included as a deliverable.*

9.2.1 Final Report

The final report shall be submitted to each state for their individual evaluation.

The test plan should provide the outline for a final report, including:

1. Description of site selection;
2. Specifications for the tested system;
3. Description of typical installation;
4. Geographic location of systems tested;
5. List of key participants;
6. Complete description of sampling and analytical methods;
7. All testing results including *raw data* and statistical data; and
8. Rationale for exclusion of data or removal of a system from statistical analysis.

Appendix: Field Log Book

9.3 Data Reduction

Data reduction (per Section 9 of NSF/ANSI 360) specific to the verification testing, and also specific to each organization, shall be summarized in the Test Plan.

9.4 Data Storage

Data storage requirements for each organization shall be provided in the Test Plan. *Each organization should keep all relevant documents that support the project's outcome (i.e., chain-of-custody forms, laboratory bench sheets, field log records) for a minimum of ten years unless another timeframe is approved by the states reviewing the plan.*

Section 10 Assessments

10.1 Audits

The Test Plan shall identify all audits (i.e., both internal systems audits and internal performance audits, where applicable) to be performed, who will perform these audits, and who will receive the audit reports. Additional supervised inspections may be conducted.

10.2 Procedures for Corrective Actions

The Test Plan shall provide procedures to be followed to ensure that necessary corrective actions will be performed in response to audit findings. The responsible party(s) for implementing corrective actions shall be identified.

Section 11 References

References shall be provided in the Test Plan either in the body of the text as footnotes or in a separate section.

NSF International Standard/American National Standard. NSF/ANSI 245 – 2010a: Wastewater Treatment Systems- Nitrogen Reduction. NSF International, November 2010.

NSF International Standard/American National Standard. NSF/ANSI 360 – 2010: Wastewater Treatment Systems-Field Performance Verification. NSF International, November 2010.