# Advanced Septic System Nitrogen Sensor Challenge, Phase II: Prototype Testing

## Background Information and Updated Testing Schedule for 2019-2021

**Timeline for the Prototype Testing:**

**July 26, 2019**
Application deadline for the August 2019 test

**August 21-27, 2019**
One-week test at MASSTC

**October 2019**
Notification of prize & acceptance for the one-month test

**December 2019 (pending testing results)**
One-month test at MASSTC for selected sensors

**February 2020**
Notification of acceptance for the six-month test

**May 13 – November 16, 2020 (pending testing results)**
Six-month field performance testing at MASSTC for selected sensors

**Mid-February 2021 (pending testing results)**
EPA prize: ISO 14034 ETV verification reports and statements

**For more information email Gail DeRuzzo at:**
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EPA selected Battelle Memorial Institute (Battelle) to support Phase II: Prototype Testing and the development of a Test/Quality Assurance Plan (T/QAP) and Verification Plan, and to oversee the testing of the sensors. The T/QAP is based on the International Organization for Standardization Environmental Technology Verification (ETV) Standard - ISO 14034. Funding for the testing program is from the US EPA Office of Research and Development and the Office of Water/Wastewater Management.

Sensor testing will be completed in 2019-20 at the Massachusetts Alternative Septic System Test Center (MASSTC), a National Sanitation Foundation (NSF) certified test facility in Barnstable, Massachusetts. There is a screening process to determine eligibility for the six-month ISO ETV 14034 field verification test. The first level of the screening is a one-week preliminary test, and developers are invited to participate in the August 2019 test. Please apply by July 26, 2019. For this final round of open prototype testing, EPA is going to award up to $50,000 in prize money to the best performing sensor(s). Successful sensors will also then be invited to the second level, a one-month screening test in December 2019. A sensor package must successfully complete the one-month test to receive an invitation to the extensive six-month field performance test.

Battelle will verify the results of the field performance tests based on the VerifiGlobal Performance Verification Protocol and the requirements of the ISO 14034 ETV standard. EPA will award ISO ETV verification reports and statements for sensors that complete the six-month field testing and meet the minimum performance goals.

# Advanced Septic System Nitrogen Sensor Challenge, Phase II: Prototype Testing Background Information

## Advanced septic system nitrogen sensor performance goals

| Attribute | Attribute Description | Performance Goals | | |
|---|---|---|---|---|
| | | Minimum | Almost Ideal | Ideal |
| Parameter[1] | What is being measured | $NO_3^-$, $NH_4^+$ | $NO_3^-$, $NH_4^+$, TOC | Total nitrogen (TN)[2] |
| Installation Price | Price to the homeowner to install | $1,500 | $1,250 | $1,000 |
| Data Management | Ability to record and transmit data (i.e., telemetry) for real-time access by practitioners, regulators, and interested stakeholders | Record and automatically transmit data to designated server or cloud | Record and automatically transmit data to designated server or cloud | Record and automatically transmit data to designated server or cloud; include remote capability of programming variable sampling frequencies. |
| Applicability & Accessibility | Applicability of sensor(s) to various innovative/alternative system designs and ease of access to OWTS for installation and maintenance | Located in-situ to provide performance information on the OWTS; must be accessible for maintenance | Located in-situ to provide performance information on the OWTS; must be accessible for maintenance | Located in-situ to provide performance information on the OWTS; must be accessible for maintenance |
| Frequency of Sensor System Maintenance | How often the sensor(s) need to be maintained | No more than quarterly | No more than semi-annually | No more than annually |
| Accuracy | Accuracy of sensor measurements to the true measurement | Within 20% of true value[3] | Within 20% of true value[3] | Within 20% of true value[3] |
| Precision | Repeatability of sensor measurements | ≤30% RSD | ≤20-30% RSD | ≤20% RSD |
| Range[4] | Range of the detection | 2-60 mg N/L | 2-60 mg N/L<br>2-60 mg/L TOC | 2-60 mg N/L |
| Frequency of Sensor Readings[5] | Capability of the sensor to provide parameter concentrations at time frequencies of: | Hourly[5] | Hourly[5] | Hourly[5] |
| Sensor Operating Temperature Range | Temperature range in which the sensor can operate | 4° C to 35° C | 4° C to 35° C | 4° C to 35° C |
| Deployment | Period of deployment | Continuous | Continuous | Continuous |
| System Lifetime | Expected life of sensor | 5 years | 5 to 10 years | 10 years |

[1] Refer to Section B1.4 for information on the sources of nitrate ($NO_3^-$), ammonia ($NH_4^+$), and total organic carbon (TOC).
[2] Total Nitrogen (TN) is defined as the sum of total kjeldahl nitrogen (ammonia, organic and reduced nitrogen) and nitrate-nitrite.
[3] True value is defined as the certified laboratory result for the parameter using approved test methods.
[4] The sensors must be capable of alerting about or otherwise notifying of an over range value.
[5] Frequency of sensor readings during the preliminary and 6-month testing are detailed in Section B1.2. For deployment in an actual application, sensor frequency readings will depend on end user needs and may vary from hourly to daily or more frequently than hourly. Sensors should have the flexibility for varying frequency of readings.

## 2021 Market Stimulation Opportunity

Following the release of the verification reports and statements in early 2021, an external technical panel and The Nature Conservancy (TNC) will review the results. TNC and others are seeking funding for an order of 200 deployable septic sensor units, not to exceed a total cost of $300,000. The order would be presented in the summer of 2021 to the best performing sensor/s that completes the 6-month field performance test and meets or exceeds the performance goals.

**For more information email Gail DeRuzzo at:**

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(This project is being conducted by Battelle for the US EPA under contract #EP-C-16-014)