

New Jersey Pinelands Commission

Alternate Design Treatment Systems Pilot Program



2020 Annual Report

**NEW JERSEY PINELANDS ALTERNATE DESIGN WASTEWATER
TREATMENT SYSTEMS PILOT PROGRAM**

2019-2020 ANNUAL REPORT

August 5, 2020

THE NEW JERSEY PINELANDS COMMISSION

Richard H. Prickett, Chairman

**Alan W. Avery, Jr.
Daniel Christy
Sean W. Earlen
Jordan P. Howell
Jerome H. Irick**

**Jane Jannarone
Edward Lloyd
Mark S. Lohbauer
William Pikolycky
Gary Quinn
D'Arcy Rohan Green**

Nancy Wittenberg, Executive Director

Susan R. Grogan, Director of Planning

**Edward Wengrowski, Environmental
Technologies Coordinator**

Pinelands Commission
P.O. Box 359
New Lisbon, New Jersey 08064
(609) 894-7300
<http://www.nj.gov/pinelands>

Executive Summary

In March of 2002, the Pinelands Commission convened an ad hoc committee to evaluate the feasibility of using high performance septic systems as a way for residential development to meet Pinelands water quality standards where the proposed development parcel is not large enough for the Commission's water quality standard to be met through dilution.

The ad hoc committee determined that septic systems capable of achieving high levels of treatment were commercially available and that several of these technologies were purported to remove nitrogen from wastewater to the extent necessary, in combination with dilution, to meet the water quality standard.

Acting on the ad hoc committee's recommendation, in August 2002 the Pinelands Commission authorized an amendment to the Pinelands Comprehensive Management Plan (CMP) to establish a pilot program to determine whether specifically authorized technologies could be installed, operated and maintained by homeowners in a manner that meets the Commission's water quality objectives.

During the intervening 18-year period since the establishment of the pilot program, the Commission has identified four technologies that can meet the Pinelands ground water quality standard of 2 mg/l total nitrogen when used on appropriately sized parcels. Specifically, the Amphidrome, Bioclere, and SeptiTech treatment technologies can meet the standard when used on minimum 1-acre parcels, and the FAST treatment technology can meet the standard when used on minimum 1.4-acre parcels.

Two technologies were removed from the pilot program: the Ashco RSF^{III} system, because its manufacturer could not supply units to the Pinelands Area, and the Cromaglass technology for its inability to remove nitrogen to the degree necessary to meet the water quality standard. Testing of the BioBarrier technology has resulted in a recommendation that the technology be removed from the pilot program due to its inability to remove nitrogen to the degree necessary to meet the water quality standard. Two other technologies, the Hoot ANR and Busse GT, are authorized for use in the pilot program. As of the date of this report, one Hoot ANR system has been installed but no testing data is available for that technology. There have been no installations of the Busse GT system since being admitted into the pilot program and as a result, the Busse GT technology has been recommended to be removed from the pilot program. Through June 2020, there are 346 residential alternate design treatment systems installed in the Pinelands Area.

Pursuant to the program rules, all pilot program treatment technologies are subject to warranty, deed notice, and system operation and maintenance requirements. In addition to serving residential development in the Pinelands Area, the Commission has also authorized commercial development to use high performance systems to meet Pinelands water quality standards through a case specific process that is outside of the pilot program.

The Commission anticipates adding new NSF Standard 245/USEPA ETV certified treatment technologies to the pilot program in late 2020 or early 2021. The performance data for those technologies will be included in future reports to the Pinelands Commission.

Lastly, since 2007, the Commission has successfully implemented a process for the review, approval and monitoring of advanced treatment systems that are used by commercial development in designated Pinelands growth areas. This process requires the execution of a legal agreement between the system owner and the Pinelands Commission, requires an NJDEP licensed wastewater treatment plant operator to maintain the system and further requires the submission of monthly effluent monitoring reports to ensure compliance with the Commission's water quality standards. This process was developed based upon experience gained through the Commission's residential pilot program.

Table 1 on the following page identifies the current status of each of the alternate design wastewater treatment systems that are currently or were previously participating in the pilot program.

Table 1. Current and prior participating treatment technologies

Technology	Status	Minimum Parcel Size Required (Acre)	Recommendation from this report	Basis for recommendation
Amphidrome	Permanent approval	1.0	No change in status	NA
Bioclere	Permanent approval	1.0	No change in status	NA
Fast	Permanent approval	1.4	No change in status	NA
BioBarrier	Piloting	2.2+	Recommend removal from pilot program	Not meeting groundwater quality standard
SeptiTech	Piloting	1.0	Recommend permanent approval	Meeting groundwater quality standard
Busse GT	Piloting	1.0	Recommend removal from pilot program	No units sold in Pinelands Area since September 2011 piloting approval
Hoot ANR	Piloting	1.0	Recommend continued participation in the pilot program	One unit installed in the Pinelands Area in July 2020. No data to report.
Ashco RSF III	Removed from pilot program	NA	No change in status	NA - Technology removed from pilot program due to lack of sales
Cromaglass	Removed from pilot program	NA	No change in status	NA- Technology removed from pilot program for not meeting groundwater quality standard

Background

The Federal National Parks and Recreation Act (1978) and New Jersey Pinelands Protection Act (1979) call for the preservation, protection and enhancement of the unique Pinelands ecosystem and its land and water resources. The exceptional quality of Pinelands water resources is protected and maintained through controls on development and other land uses and through close cooperation and coordination between local, state and federal agencies. To safeguard Pinelands water resources, the water quality provisions of the Pinelands Comprehensive Management Plan (CMP), (available for download at <https://www.state.nj.us/pinelands/cmp/>) focus on controlling the amount of nitrogen that enters the environment. Nitrogen is a significant point and nonpoint source pollutant due to its role in the eutrophication of surface water bodies. It is a useful indicator of overall Pinelands water quality and ecosystem health because it is naturally present in very low concentrations in the Pinelands environment. In recent years, there has been much attention focused on the role that excessive nitrogen has played in the decline of the Barnegat Bay ecosystem. The Pinelands Area accounts for 33% of Barnegat Bay's Watershed, and efforts to control nitrogen releases in the Pinelands Area can have a significant impact on both the Pinelands and Barnegat Bay. The Pinelands CMP has long recognized the importance of controlling nitrogen on both local and regional scales and provides for the establishment of land use policies and engineering solutions to protect the region's sensitive ecology.

The Commission's land use program discourages development in important ecological and agricultural areas while directing growth towards more suitable areas. While some of the designated growth areas are served by central sewer systems, others are not. In these unsewered growth areas, municipalities may zone for residential development on lots as small as one acre. One acre lots are also permitted in non-growth areas if certain cultural housing and grandfathered ownership conditions are met. In very limited instances, waivers of strict compliance allow for development of unsewered dwellings on lots as small as 20,000 square feet.

The CMP's water quality standards permit the use of on-site septic systems (individual subsurface sewage disposal systems) provided that the design of the system and the size of the parcel on which the system is located will ensure that the concentration of nitrogen in the ground water exiting the parcel or entering a surface water body will meet the Commission's water quality standard of two parts per million (ppm), also expressed as 2 mg/l. The CMP uses the Pinelands Septic Dilution Model (available for download at <https://www.nj.gov/pinelands/appli/tools/#7>) to calculate nitrogen loading to groundwater from septic systems and to confirm that proposed loadings do not exceed the assimilative capacity of the environment. When standard values for home occupancy, wastewater volume, wastewater strength and rainfall infiltration are used in solving the model, the model calculates that a minimum 3.2-acre parcel is required to dilute nitrogen to the required two ppm concentration when conventional septic system technology is used. Conventional septic system technology, typically consisting of a septic tank and effluent dispersal field (and sometimes a pump and dosing tank), effectively removes pathogens from wastewater when properly designed, sited and maintained. However, conventional septic systems do not reduce nitrogen levels in wastewater. Thus, unsewered residential development using conventional septic systems is permitted only on minimum 3.2-acre parcels, ensuring that sufficient land area is available to meet nitrogen-based water quality standards through dilution.

In order to comply with the Pinelands water quality standard, unsewered residential development on parcels smaller than 3.2 acres requires the use of high performance or advanced denitrifying wastewater treatment technology. If the mass of nitrogen contained in wastewater discharged from an on-site septic system is sufficiently reduced through the use of an advanced treatment system, the Pinelands Septic Dilution Model calculates that the minimum parcel size required to meet the 2 ppm nitrogen concentration may be reduced from 3.2 acres down to a minimum 1.0 acre.

The basic principles of biological nitrogen reduction (BNR) in wastewater treatment are well documented in the scientific and engineering literature. In fact, biological nitrification and denitrification is now routinely employed at many large-scale regional sewage treatment plants, especially those that discharge treated effluent to environmentally sensitive receiving waters. These large-scale treatment facilities employ professionally trained and licensed operators and can enhance nitrogen removal through the use of chemical feed equipment. Further, large-scale treatment plants can make real time process modifications in response to changing influent wastewater characteristics to meet permitted effluent limits.

The use of biological denitrification technologies at the much smaller scale of individual onsite systems is a relatively recent development. The U.S. Environmental Protection Agency (EPA), third party testing centers, as well as several

individual states and regions, have developed and are currently administering programs to study the effectiveness of onsite wastewater denitrification treatment technologies. The Ad Hoc Committee on Alternative Septic Systems, convened by the Pinelands Commission in March 2000, conducted a thorough review of this ongoing work to evaluate alternate treatment technologies nationwide, consulted with officials from other state and university programs involved with advanced on-site septic system technologies and management strategies, retained an engineering consultant to assess the performance of selected technologies, met with treatment system manufacturers and county health officials, and coordinated research efforts with the New Jersey Department of Environmental Protection (NJDEP). After completing this work, the Pinelands Commission's Committee on Alternative Septic Systems recommended the establishment of a pilot program to test five specific onsite wastewater treatment technologies. (The pilot program has subsequently been expanded to test an additional four advanced treatment technologies). The Alternative Design Wastewater Treatment Systems Pilot Program detailed in the CMP at N.J.A.C. 7:50-10.21 is authorized as a means to test whether these advanced treatment technologies can be operated and maintained in a manner that meets Pinelands water quality standards, with maintenance requirements that a homeowner can reasonably be expected to follow.

Abridged timeline for the Pinelands Alternate Design Wastewater Treatment Systems Pilot Program:

- Aug. 5, 2002 Effective date of the pilot program; residential development applications received after this date for parcels smaller than 3.2 acres that are not served by public sewer are required to use a Pinelands alternate design wastewater treatment system. Completed applications received prior to this date were permitted to use a pressure dosing septic system, provided the installation was completed by August 5, 2004.

- Nov. 3, 2006 Executive Director's Implementation Report issued to the Commission (available at: http://www.state.nj.us/pinelands/images/pdf%20files/Final_110306_Pilot_Septic_Implement_Report.pdf.) The report recommended the removal of the Ashco RFS^{III} system from the pilot program due to its commercial unavailability, imposition of a temporary suspension of new Cromaglass installations based upon non-attainment of effluent total nitrogen targets and the establishment of various pilot program deadlines to allow continued installation of the pilot program systems.

- June 15, 2009 Publication of proposed CMP amendments (N.J.A.C. 7:50-2.11, 3.39 and 6.85) addressing septic system management.

- Nov. 5, 2009 Executive Director's second Implementation Report issued to the Commission (available at http://www.state.nj.us/pinelands/landuse/waste/Final_Nov%202009_ImplementationReport.pdf). The report discussed the nitrogen removal efficiencies of the treatment technologies, system maintenance requirements, treatment technology costs and system operational issues. The Report also contained an evaluation of the number of systems installed and a determination as to the adequacy of that number to render a final determination on the effectiveness of the treatment technologies in meeting the purposes and objectives of the State and Federal Pinelands Protection Acts.

- June 7, 2010 Effective date of CMP amendments that established requirements for the long-term management of Pinelands alternate design wastewater treatment systems.

- Oct. 18, 2010 Effective date of CMP amendment authorizing permanent approval of the Amphidrome and Bioclere technologies to serve residential development on minimum 1-acre parcels. The amendment also authorized the addition of up to four new NSF 245 USEPA ETV certified treatment technologies to the pilot program for installation through August 5, 2016.

- Dec. 5, 2011 Notice published in the New Jersey Register announcing acceptance of the four "new" technologies (BioBarrier, Busse Green, Hoot ANR and SeptiTech) for participation in the pilot program.

- Nov. 5, 2012 Executive Director's third Implementation Report issued to the Commission (available at: https://www.nj.gov/pinelands/landuse/current/altseptic/Final%20Nov%202012_Implementat

sample deed notice. In addition, the New Jersey Department of Environmental Protection (NJDEP) had to first issue a Treatment Works Approval (TWA) authorizing local/county health departments to approve such systems pursuant to N.J.A.C 7:9A Standards for Individual Subsurface Sewage Disposal Systems (7:9A-3.9(a)4).

Use of the high performance alternative onsite wastewater treatment systems is now authorized in each of the Pinelands Area municipalities as a result of amendments to the CMP that became effective on December 3, 2007. Prior to that amendment, the pilot program technologies were only authorized for use in municipalities that had adopted an ordinance to implement the pilot program. Although most municipalities had adopted the requisite ordinance (34 of 40), the Commission found that applicants in the non-adopting municipalities were unable to proceed with their applications and, as a result, were subjected to considerable hardship. The December 3, 2007 amendments provided applicants in those municipalities with needed relief as they are now permitted to use a pilot program treatment system on an otherwise developable parcel.

The CMP also requires that each technology manufacturer or its agent submit a semi-annual report to the Executive Director. Such reports must include information on the number of systems installed, a discussion on the installation of systems, an analysis and evaluation of wastewater monitoring results to date, and a discussion of any operational or maintenance issues experienced.

Summary of Program Activity

The Pinelands Alternate Design Wastewater Treatment Systems Pilot Program was made possible as a result of two consecutive funding grants provided by the NJDEP (Grant Identifiers RP02-012 and RP05-056). In May 2009, Commission staff satisfied the final grant deliverable by providing the NJDEP, Division of Watershed Management with the Final Report on the “Atlantic Coastal Watershed Region Program Grant: Decentralized Wastewater Management in the Mullica River Basin and Other Pinelands Watersheds”. The Commission posts the findings of the pilot program on its website to further the technology transfer goals of the program and to share relevant information with other entities engaged in protecting ecologically sensitive regions. In addition to posting pilot program information, the Commission distributes copies of the pilot program annual reports to the NJDEP and to the seven county health departments having jurisdiction in the Pinelands Area.

Septic System Management Initiatives

Pinelands Commission [N.J.A.C 7:50] Pinelands Comprehensive Management Plan

Since its inception, the Pinelands Commission has recognized the environmental benefits of periodic septic system maintenance. The CMP has long required that septic systems in the Pinelands be inspected and pumped at least once every three years and that written proof of maintenance be submitted to the local boards of health. In June 2009, the Commission proposed several amendments to the CMP at N.J.A.C. 7:50-2.11, 3.35, and 6.85 to further address septic system management. Those proposed amendments were related to the management of both conventional septic systems as well as advanced pilot program treatment systems. The rule proposal aimed to establish a framework for institutional or governmental programs to ensure the proper long-term operation and maintenance of all onsite wastewater systems in the Pinelands.

The Commission received extensive public comment on the septic system management rule proposal. A great number of the comments were opposed to requirements for the management of conventional septic systems. Responding to public opposition, the Commission withdrew the section of the proposal related to conventional septic systems and adopted only those portions of the proposal that required long term management of the advanced pilot program technologies. This action resulted in the continuation of the existing CMP rule related to the triennial inspection and pumping of conventional septic systems. Subsequently, in April of 2012, the NJDEP adopted comprehensive amendments to the Standards for Individual Subsurface Disposal Systems (see N.J.A.C 7:9A-8.3 and 12.3, discussed in more depth below). These amendments addressed the long-term management of advanced pretreatment systems, including the Pinelands alternate design treatment systems. Considering the adoption of duplicative NJDEP regulations, in July 2017, the Commission approved amendments to the CMP to eliminate the Commission’s then redundant septic system management requirements, aiming to unify and simplify the statewide management of advanced wastewater treatment systems under NJDEP’s equally protective rules.

In April 2013, Commission staff organized, hosted and led an interagency meeting between Commission staff, NJDEP and representatives of the seven Pinelands Area Health Departments to review the NJDEP's septic system management requirements. This meeting was instrumental in clarifying the applicable rules and in raising awareness of the management obligations of the participating regulatory entities.

The Commission has continued its dialogue with the county health departments regarding their responsibilities under N.J.A.C 7:9A-7:9A-8.3(e) and N.J.A.C 7:9A-12.3, to ensure that advanced treatment systems are properly operated and maintained. The Commission's staff has further worked to inform the advanced treatment system service providers of their own obligations specified at N.J.A.C 7:12.3(d). This NJDEP regulation requires service providers to notify the county health officials when a service contract has lapsed, so that the health officials can follow-up with the system owner. Under NJDEP's rules, advanced wastewater treatment systems that are not covered by a service contract with an authorized service provider are deemed to be non-compliant systems. In the Pinelands Area, county health officials are tasked with enforcing these NJDEP's regulations.

NJDEP [N.J.A.C. 7:15] Water Quality Management Plan

In addition to the septic system management requirements contained in N.J.A.C 7:9A, additional septic system management requirements are specified in NJDEP's Water Quality Management Planning (WQMP) rules (N.J.A.C 7:15-4.5(c)1.vi), last amended on November 7, 2016. These state-wide rules require that municipalities demonstrate that areas served by septic systems are subject to a mandatory maintenance program, such as an ordinance, to ensure that all septic systems are functioning properly.

NJDEP [N.J.A.C. 7:9A] Standards for Individual Subsurface Sewage Disposal Systems

In April 2012, the NJDEP readopted state-wide Standards for Individual Subsurface Sewage Disposal Systems (Standards) (N.J.A.C 7:9A). These rules require that local/county health departments provide operation and maintenance information triennially to septic system owners whose systems were approved after January 1, 1990. The comprehensive notices must include:

1. A general outline of how septic systems work and the potential impact of improper operation on ground and surface water quality and public health;
2. The recommended frequency of septic tank and grease trap pumping and instructions on how to determine when pumping is necessary;
3. A list of materials containing toxic substances that are prohibited from being disposed of into a septic system;
4. A list of inert or non-biodegradable substances that should not be disposed of into a septic system;
5. Proper practices for maintaining the area of the septic leach field;
6. Negative impacts to a septic system resulting from excessive water use; and
7. Warning signs for poor system performance or malfunctions and recommended or required corrective actions.

The NJDEP Standards, as amended on April 2, 2012, for the first time, authorize the state-wide use of advanced onsite wastewater treatment systems for new construction without first requiring a Department-issued TWA permit, provided the technology is not being used to meet a state or federal water quality standard. Where the treatment technology is being proposed to meet a state or federal water quality standard, a TWA permit is required. The NJDEP Standards require that local or county health departments maintain records on each advanced treatment system in their jurisdiction and provide annual reports to the NJDEP with respect to the following:

- i. The type of advanced wastewater treatment device installed;
- ii. The location of each installed device;
- iii. The type of use (e.g., residential or commercial);
- iv. The type of disposal area (e.g., bed, trench, drip dispersal);
- v. The date of installation and startup; and
- vi. The date of each inspection and maintenance call.

The NJDEP's system management standards are, in many ways, similar to those of the Commission's pilot program. For example, the owner of each advanced treatment system must have a service contract with an authorized service

provider throughout the life of the system. The NJDEP standards require system owners to provide the local or county health department with a copy of the service contract prior to the health department's initial approval of the system. If a property owner enters into a contract with a different service provider upon expiration of an existing contract, the homeowner must provide the health department with the new contract within 14 days of making the change. Importantly, if a property owner fails to renew a service contract, the previously authorized service provider is required to provide written notice to the health department within 30 days of the contract expiration. Authorized service providers must provide copies of system inspection forms to the health department within 30 days of the inspection. Pursuant to the NJDEP standards, the failure of a property owner to maintain a service contract on an advanced treatment system constitutes a violation of the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq., and represents a noncompliant system violation as defined by N.J.A.C 7:9A.

The NJDEP standards that are related to the installation and use of advanced treatment systems apply state-wide to all advanced treatment systems, including the Pinelands alternate design pilot program wastewater treatment systems.

The county health departments have reported that since April 2012, they have approved a significant number of advanced treatment systems for use outside of the Pinelands pilot program. These advanced systems are often proposed to reduce the size and perhaps most commonly the height of disposal field installations by taking advantage of a 2.5-foot reduction in the minimum vertical separation distance required to the seasonal high-water table when an advanced treatment system is used. As a result, the county health departments must ensure proper operation and maintenance is conducted on all advanced treatment systems, not only those authorized for use through the Pinelands pilot program.

Commission staff and NJDEP staff from the Bureau of Nonpoint Pollution Control continue to work to ensure that the Pinelands Area health departments, Pinelands alternate design treatment system manufacturers and service providers are aware of the NJDEP's April 2, 2012 rule adoption, particularly with respect to the NJDEP's operation and maintenance contract requirements and health department enforcement provisions.

Educational Resources

The Commission staff continues to provide assistance to Pinelands Area municipalities and health departments to help them comply with the NJDEP's (N.J.A.C. 7:15 and N.J.A.C. 7:9A) septic system management requirements. The Commission has produced a number of useful educational documents for use by residents and public health officials.

Municipalities and health departments are encouraged to consult the *Onsite Wastewater Systems Management Manual for the New Jersey Pinelands*, (prepared by Stone Environmental, Inc. under contract to the Commission) http://www.state.nj.us/pinelands/landuse/current/septic/WW%20Mgt%20Manual_2008.09.05.pdf for guidance on the establishment of septic system management programs. This manual explores several management models for municipalities and others to consider and provides flexibility in the selection of any single model or any combination of model elements that are locally appropriate. In addition, municipalities and health departments are also encouraged to consult the report entitled *Legal Basis and Regulatory Framework of Onsite Wastewater Management in the New Jersey Pinelands* (also prepared by Stone Environmental, Inc. under contract to the Commission). http://www.state.nj.us/pinelands/landuse/current/septic/Pinelands_OWTS_Legal_Framework_Final.pdf. These reports, as well as other related materials, including an informative septic system maintenance guidance document directed at homeowners, are posted on the Commission's website at www.nj.gov/pinelands. In addition, Commission staff produces and distributes training materials at the Rutgers Onsite Wastewater Treatment Systems seminars when such courses are offered by Rutgers University's Office of Continuing Professional Education.

Pilot Program Amendments

Since the original adoption of the pilot program in August 2002, several pilot program-related amendments to the CMP have been adopted. These include:

1. A remedy for landowners in municipalities that had not yet adopted ordinances to implement the pilot program;
2. Removal of one technology (Ashco RFS^{III}) from the pilot program due to the manufacturer's inability to provide the technology to Pinelands residents;

3. Providing for management of pilot program treatment systems beyond the original five-year mandatory maintenance contract period;
4. Extending the period of the pilot program to better evaluate both existing and new treatment technologies;
5. Granting permanent approval status to three of the pilot program technologies (Amphidrome, Bioclere and FAST);
6. Eliminating Cromaglass from the pilot program due to its inability to meet Pinelands water quality standards;
7. Authorizing the Commission to approve up to four new pre-screened NSF International / American National Standards Institute (ANSI) Standard 245 and/or United States Environmental Protection Agency - Environmental Technology Verification (USEPA ETV) certified technologies to participate in the pilot program. The Commission has approved the BioBarrier, SeptiTech, Hoot ANR and Busse Green GT systems to participate in the pilot program;
8. Requiring that local /county boards of health withhold certificates of compliance or similar authorizations that would permit the occupancy of a building served by an alternative design wastewater treatment system until such time as the Pinelands Commission provides written authorization to the local board of health that such a system may be authorized for use;
9. Eliminating the deadline to install pilot program systems in recognition of the Executive Director's ability to increase the minimum required parcel size or to suspend any technology's participation in the pilot program for failure to comply with the program requirements; and
10. Simplifying the requirements for the management of advanced treatment systems by removing the duplicative requirements in the CMP and relying instead on the NJDEP's comprehensive advanced system management requirements contained in N.J.A.C 7:9A.

NJDEP Treatment Works Approvals

The NJDEP has provided welcome assistance to the Commission throughout the development and implementation of the pilot program. As noted above, the NJDEP reissued a Generic TWA to expedite local health department approvals of all of the Pinelands pilot program systems. The TWA permit allows the use of the Pinelands pilot program systems without individual applicants being subject to the standard \$850 NJDEP permit fee or the standard 90-day review period. The expedited NJDEP Generic TWA Permit has been well received by both the regulatory and development community. It has proven to be an effective instrument by allowing individual applications to be approved directly by the Pinelands county health departments, resulting in significant time and expense savings to applicants.

Importantly, the generic TWA applies only to residential development that proposes to use a pilot program treatment system. Commercial development that proposes to use an advanced wastewater treatment system in order to meet Pinelands water quality standards must attain an individual TWA from NJDEP, pursuant to the requirements at N.J.A.C 7:9A-3.9(a)4.

Local and Regional Training and Technology Transfer

Throughout the duration of the pilot program, Commission staff has participated in local, regional, and national educational conferences to share the Commission's experiences. Staff has developed targeted training sessions for each of the Pinelands Area Health Departments to review Pinelands and NJDEP septic system regulations, fundamentals of biological nutrient removal, and design, operation and maintenance requirements for advanced onsite treatment technologies. Representative regional training sessions include a USEPA conference in Mt. Kisco, NY, multiple New Jersey Environmental Health Association conferences in Atlantic City, NJ, a National Environmental Health Association conference in Atlantic City, NJ, a Massachusetts Health Officers Association conference in Springfield, MA, a New England Interstate Water Pollution Control Commission conference in Groton, CT, a National Environmental Health Association conference in Tucson, AZ, a Central Pine Barrens (Long Island) Joint Planning Commission conference in Brookhaven, NY, a Peconic Bay (Long Island) Advanced Wastewater Treatment Systems

Water Quality Symposium in Hauppauge, NY, and a keynote address at the Onsite Water Protection Conference at North Carolina State University in Raleigh, N.C.

Commission staff has met with each of the Pinelands Area health departments to facilitate implementation of the pilot program and to assist the health departments in their review of plans and applications and to train inspectors on the alternative treatment technologies. In addition, Commission staff presents regularly at the Rutgers/NJDEP Onsite Wastewater Treatment Systems Seminars held in New Brunswick and Bordentown, NJ. The Rutgers/ NJDEP program provides classroom training to professionals engaged in the onsite wastewater industry including state, local, regional and state-agency public health professionals, advanced treatment system manufacturers, septic system design engineers, system installers, and onsite system service providers. In addition, staff assists Pinelands Area residents by responding to questions related to the care and use of onsite wastewater systems. Moreover, Commission staff has conducted evening workshops throughout the Pinelands Area to enhance awareness of the connection between septic system maintenance and clean water, property values and public health. Lastly, Commission staff regularly provides telephone assistance to homeowners, builders, developers and consulting engineers in complying with the requirements of the pilot program.

Treatment Technologies Installation Summary

The Alternate Design Treatment Systems Pilot Program was adopted through an August 5, 2002 amendment to the CMP. The pilot program originally included the first five technologies listed below. It has since been expanded to include four additional NSF Standard 245 and USEPA ETV certified treatment technologies. The complete list of pilot program technologies includes:

1. ~~Ashco RFS~~^{III a}
2. Amphidrome^b
3. Bioclere^b
4. ~~Cromaglass~~^c
5. FAST^d
6. BioBarrier
7. Hoot ANR
8. Busse GT
9. SeptiTech

Notes:

^aAmendments to the CMP, effective December 3, 2007, removed the Ashco RFS^{III} from the pilot program due to the manufacturer's failure to make the system commercially available in the Pinelands during the initial five year period of the pilot program and to otherwise demonstrate the ability or intention for future participation in the program.

^bAmendments to the CMP, effective October 18, 2010, permanently approved the Amphidrome and Bioclere technologies for use on minimum 1.0 acre parcels.

^cAmendments to the CMP, effective September 2, 2014, removed the Cromaglass technology from the pilot program due to the technology's inability to meet Pinelands water quality standards and to otherwise demonstrate the ability or intention for future participation in the program. Installation of the Cromaglass technology ceased before that date as the result of a temporary suspension instituted by the Commission in 2006. Sixteen applicants with prior construction approvals were permitted to install the Cromaglass system after the imposition of the temporary suspension.

^dAmendments to the CMP, effective March 5, 2018, permanently approved the FAST technology for use on minimum 1.4-acre parcels.

Three hundred and forty-six (346) Pinelands alternate design treatment systems have been installed and activated through June 5, 2020. The first pilot program system came online in April 2004. Fifteen systems were installed during the current reporting period (July 2019 through June 2020). The following tables and figures summarize annual installations of each technology and their location.

Table 2. Installed Pilot Program Technologies by Year of Installation

Technology	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total Installed
Amphidrome	7	10	10	27	12	7	5	8	4	5	1	1	4	2	5	6	4	118
Bioclere	0	2	11	9	7	9	6	5	5	5	8	4	4	1	1	3	2	82
Cromaglass	0	19	24	3	6	4	3	0	0	0	0	0	0	0	0	0	0	59
FAST	0	0	0	0	2	5	3	3	3	5	2	2	0	0	3	1	1	30
SeptiTech	Admitted into the pilot program in 2013										3	9	11	7	5	1	8	44
BioBarrier	Admitted into the pilot program in 2013										5	7	0	0	1	0	0	13
Total	7	31	45	39	27	25	17	16	12	15	19	23	19	10	15	11	15	346

Table 3. Installed Pilot Program Technologies by County and Municipality

County	Municipality	Technology						Total
		Amphidrome	Bioclere	Cromaglass	FAST	SeptiTech	BioBarrier	
Atlantic	Egg Harbor Twp	2	5		2			9
	Estell Manor		6					6
	Folsom	5	3	1	1			10
	Galloway	1	1		1			3
	Hamilton	15	21	4	1			41
	Hammonton	4	2		1			7
	Mullica	3	5		1	1		10
Burlington	Port Republic				1			1
	Evesham	1	1					2
	Medford	3	1		2	7		13
	Pemberton	12	12	23				47
	Shamong	2						2
	Tabernacle	3	5	1	1	7	1	18
	Washington	1	1					2
	Woodland	1	3		3	1		8
Camden	Bass River							0
	Chesilhurst		1					1
	Waterford	3						3
Cape May	Winslow	8	6	4	6	16		40
	Dennis	1						1
	Upper Woodbine	2	2					4
Gloucester	Franklin		1		3			5
	Monroe				2			2
Ocean	Jackson	20	2	16	5	10	12	65
	Lacey	2						2
	Manchester	24	2	9		2		37
	Stafford	5	1					6
Total Installations		119	81	59	30	44	13	346

Note: Most systems installed in Pemberton Township are located in the Presidential Lakes subdivision, which was the subject of a prior Commission approval that required the use of pressure dosing septic systems. Bioclere alternate design treatment systems

Figure 1. Number of Alternate Design System Installations by Year

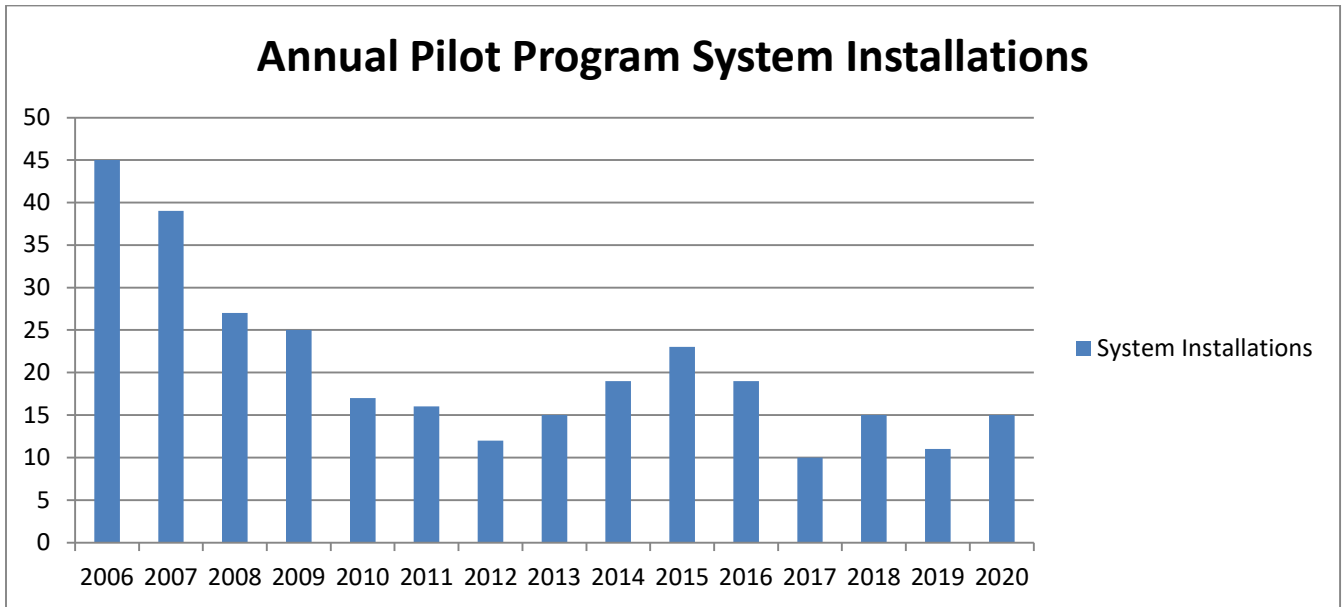
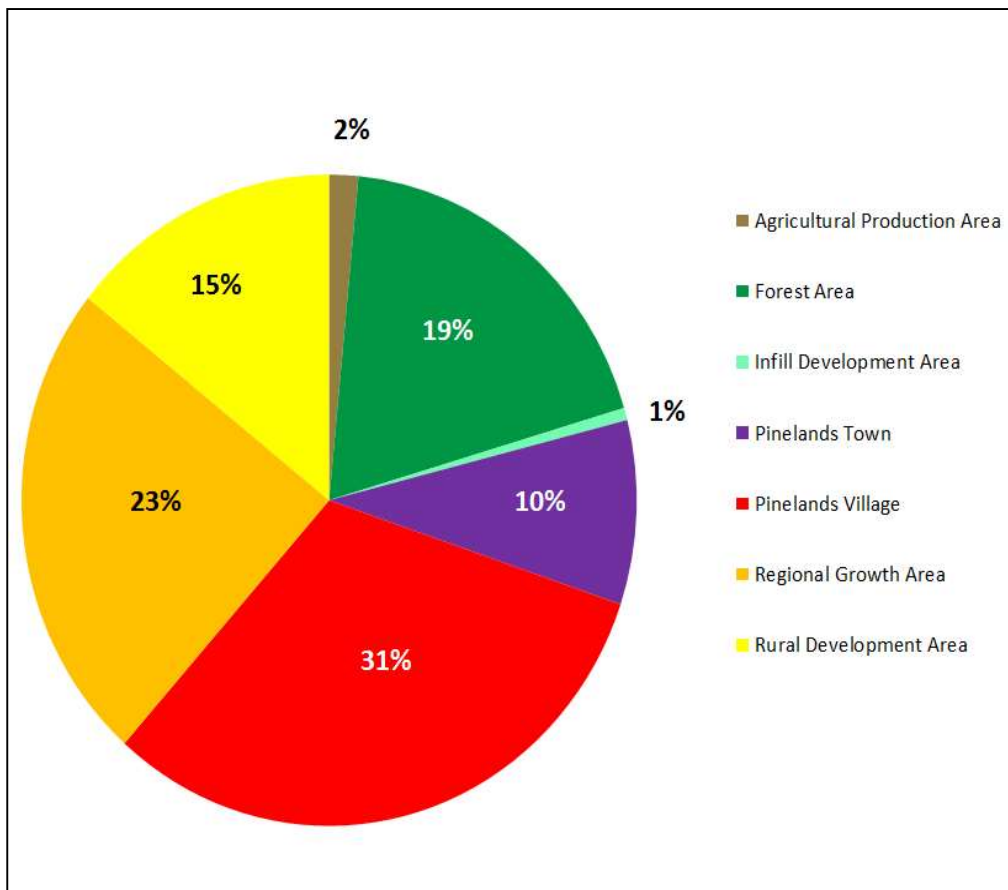


Figure 2. Percentage of Alternate Design System Installations by Pinelands Management Area



Administrative Approval of Technologies

In accordance with N.J.A.C 7:50-10.22, prior to being certified for use, the manufacturer of each alternate design treatment system had to submit specific documents to the Executive Director for review and approval. These documents included detailed engineering plans and specifications, a Homeowners Manual on the proper use and operation of the system, a service provider's Operation and Maintenance Manual, a sample five-year warranty, a sample five-year operation and maintenance service contract, wastewater sampling and analysis protocols, and a sample deed notice to be filed with the County Clerk prior to the operation of each system to alert future property owners of the need to maintain the pilot program system. Upon approval by the Executive Director, these record documents were distributed to each of the seven Pinelands Area health departments and are on file at the Commission's headquarters.

Technology Approvals – First Round

Ashco-A-Corporation provided the required documentation and based upon a detailed review by Commission staff, the Executive Director approved the **Ashco RFS^{III} system** effective May 15, 2003. However, as noted above, the Ashco RFS^{III} was subsequently eliminated from the pilot program due to the firm's inability to supply treatment units to the region.

F.R. Mahony & Associates, the manufacturer of the **Amphidrome system**, provided the required documentation and, based upon a detailed review by Commission staff, the Executive Director approved the single family Amphidrome technology effective July 24, 2003. Based upon a comprehensive analysis of all effluent monitoring data, the Amphidrome technology has produced a grand median total nitrogen concentration of **11.9 mg/l**. As noted above, the Amphidrome treatment technology has been released from the pilot program and granted permanent approval status in the CMP for residential use on minimum **1.0 acre** parcels. As a result, F.R. Mahony & Associates is no longer required to submit monitoring and operational data to the Commission. The Amphidrome technology must still be designed to accommodate effluent sampling, certified prior to and after construction by the manufacturer or agent and by a NJ licensed professional engineer to be properly designed and operational, equipped with local and remote alarm functionality, sold with a five-year warranty and covered under a renewable operation and maintenance contract for as long as the system is in active use.

Aquapoint, Inc., the manufacturer of the **Bioclere system**, provided the required documentation and, based upon a detailed review by Commission staff, the Executive Director approved the single family Bioclere technology effective November 18, 2003. Based upon a comprehensive analysis of all effluent monitoring data, the Bioclere technology has produced a grand median total nitrogen concentration of **11.2 mg/l**. As noted above, the Bioclere treatment technology has been released from the pilot program and granted permanent approval status in the CMP for residential use on minimum **1.0 acre** parcels. As a result, Aquapoint is no longer required to submit monitoring and operational data to the Commission. The Bioclere technology must still be designed to accommodate effluent sampling, certified prior to and after construction by the manufacturer or agent and by a NJ licensed professional engineer to be properly designed and operational, equipped with local and remote alarm functionality, sold with a five-year warranty and covered under a renewable operation and maintenance contract for as long as the system is in active use.

Cromaglass, Inc., the manufacturer of the **Cromaglass system**, provided the required documentation and, based upon a detailed review by Commission staff, the Executive Director approved the Cromaglass technology effective December 29, 2004. Based upon the Pinelands Septic Dilution Model, the pilot program originally required that each Cromaglass system be located on a parcel containing at least one acre for each dwelling unit to be served by the system. As discussed herein, the Cromaglass technology was placed under a temporary suspension in November 2006 as a result of the technology's inability to meet expected total nitrogen concentrations in treated effluent. That suspension prohibited future installations of the Cromaglass technology. Effective September 2, 2014, the Cromaglass technology was removed from the pilot program due to the technology's inability to meet Pinelands water quality standards and the manufacturer's failure to comply with the requirements of the pilot program. Based upon a comprehensive analysis of all effluent monitoring data, the Cromaglass technology produced a grand median total nitrogen concentration of **31.5 mg/l**. Homeowners in the Pinelands Area that currently use a Cromaglass system are not required to replace it. They have the option to continue to use the system in a manner consistent with the operation and maintenance requirements of N.J.A.C 7:9A-12.3 or, if they choose, they may replace the Cromaglass treatment tank with a conventional septic tank meeting the current requirements of NJDEP's Standards for Individual Subsurface Sewage Disposal Systems. The Commission can provide plan details on how to convert a Cromaglass treatment tank to function as a conventional septic tank.

Bio-Microbics, Inc., the manufacturer of the **FAST system**, provided the required documentation and, based upon a detailed review by Commission staff, the Executive Director approved the FAST system effective June 9, 2005. Based upon a comprehensive analysis of all effluent monitoring data, the FAST technology has produced a grand median total nitrogen concentration of **18.2 mg/l**. Application of the Pinelands Septic Dilution Model indicates that the FAST technology can be expected to meet the Commission's 2 mg/l total nitrogen standard when it is used to serve residential development on a minimum **1.4 acre** parcel. Accordingly, effective March 5, 2018 the CMP was amended to permanently approve the FAST technology for use on minimum 1.4-acre parcels. The FAST technology must still be designed to accommodate effluent sampling, certified prior to and after construction by the manufacturer or agent and by a NJ licensed professional engineer to be properly designed and operational, equipped with local and remote alarm functionality, sold with a five-year warranty and covered under a renewable operation and maintenance contract for as long as the system is in active use.

Technology Approvals – Second Round

Hoot Systems, LLC, the manufacturer of the **Hoot ANR system**, provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single-family Hoot ANR technology effective September 14, 2011. Based upon the Pinelands Septic Dilution Model, each Hoot ANR system must be located on a parcel containing at least **1.0 acre** for each dwelling unit to be served by the system. There have been no installations of the Hoot technology in the Pinelands Area to date. While there are currently no Hoot ANR systems operating in the Pinelands Area, and therefore no data to report, the first pilot program Hoot system was installed in July 2020.

SeptiTech, LLC, the manufacturer of the **SeptiTech system**, provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single-family SeptiTech system effective September 14, 2011. Based upon a comprehensive analysis of all effluent monitoring data, the SeptiTech technology has produced a grand median total nitrogen concentration of **11.3 mg/l**. As originally approved, based upon the Pinelands Septic Dilution Model and NSF testing data, each SeptiTech system needed to be located on a parcel containing at least one acre for each dwelling unit to be served by the system. Application of the Pinelands Septic Dilution Model indicates that the SeptiTech system can be expected to meet the Commission's 2 mg/l total nitrogen standard when it is used to serve residential development on a minimum 1.0-acre parcel. As a result, **Commission staff has recommended that the SeptiTech technology be released from the pilot program and granted permanent approval status to serve residential development on minimum 1.0-acre parcels.** The Pinelands Commission formally proposed amendments to the CMP in July 2020 to release SeptiTech from the pilot program and grant permanent approval for residential use on minimum 1.0 acre parcels. If approved for use on one acre parcels, the SeptiTech technology would still need to be designed to accommodate effluent sampling, certified prior to and after construction by the manufacturer or agent and by a NJ licensed professional engineer to be properly designed and operational, equipped with local and remote alarm functionality, sold with a five-year warranty and covered under a renewable operation and maintenance contract for as long as the system is in active use.

Bio-Microbics, Inc., the manufacturer of the **BioBarrier system**, provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single family BioBarrier system effective September 14, 2011. As originally approved, based upon the Pinelands Septic Dilution Model and NSF testing data, each BioBarrier system needed to be located on a parcel containing at least one acre for each dwelling unit to be served by the system. As discussed in more detail below, based upon effluent monitoring data, new applications proposing to use the BioBarrier technology were required to provide a minimum 1.7-acre parcel. Subsequently, additional data suggested the technology would require a minimum 2.2-acre parcel to meet Pinelands water quality standards. In response to these findings, Bio-Microbics instituted a voluntary moratorium on new installations of this technology. **Because the latest data analysis indicates that the technology requires a minimum parcel size of at least 2.2 acres to meet Pinelands water quality standards Commission staff has recommended that the Commission discontinue BioBarrier's participation in the pilot program. Accordingly, in July 2020, the Pinelands Commission formally proposed an amendment to the CMP to remove the BioBarrier technology from the pilot program.**

Busse Green Technologies, Inc., the manufacturer of the **Busse GT system**, provided the required documentation (including the NSF Standard 245 certification report) and, based upon a detailed review by Commission staff, the Executive Director approved the single family Busse Green MBR_system effective September 14, 2011. Based upon the Pinelands Septic Dilution Model, each Busse Green MBR system must be located on a parcel containing at least **1.0 acre** for each

dwelling unit to be served by the system. There have been no installations of the Busse GT technology to date in the Pinelands Area. **Because the manufacturer has not installed any systems in the Pinelands Area since originally being approved to participate in the pilot program in September 2011, Commission staff recommended that the Commission discontinue Busse GT's participation in the pilot program. Accordingly, in July 2020, the Pinelands Commission proposed an amendment to the CMP to remove the Busse technology from the pilot program.**

System Permitting and Local Approvals

The pilot program relies upon the cooperation of local construction code officials, county health officials, treatment system manufacturers, system installers, certifying engineers and Pinelands staff to coordinate the approval of wastewater system engineering plans, the issuance of building permits, the approval of wastewater system installations and the issuance of certificates to occupy residences served by the alternative treatment technologies. Prior to any Pinelands alternative treatment system receiving a final operational approval, the Pinelands Area health departments and the Pinelands Commission are to receive an executed five-year maintenance contract, five-year warranty, three-year wastewater sample and analysis protocol (for systems being piloted), deed notice, as-built plan and construction certification from the technology manufacturer and a NJ licensed engineer. While these documents have been received in most cases, there have been instances where certificates of occupancy were issued before all required documentation was received by the health department and the Pinelands Commission. In these cases, Pinelands staff must work with the technology vendors, homeowners and agency officials to obtain the needed documentation after the fact, which is often a difficult and time-consuming task. Pinelands Commission staff continue to work with the local agencies to educate them on the importance of ensuring that all necessary documents are on file before issuing local approvals for home occupancy. To further help address this issue, amendments to the CMP were adopted in October 2010 to specifically require that local boards of health withhold certificates of compliance or similar authorizations that would permit the occupancy of a building served by an alternative design wastewater treatment system until such time as the Pinelands Commission provides written authorization to the local board of health that such a system is authorized for use.

Operation and Maintenance Summary

The manufacturer of the Amphidrome system, F.R. Mahony Associates, has instituted an effective program to assist contractors and engineers on the proper installation of the technology. The firm offers installer training with each system delivered and provides ongoing technical support to address contractor inquiries through its authorized service provider, Site Specific Design, Inc.

Aquapoint, the manufacturer of the Bioclere system, has also instituted an effective program to assist contractors and engineers on the proper installation of the technology and has utilized the services of Advanced Nitrate Solutions in the local sale, installation, operation and maintenance of the Bioclere technology.

During the period of 2005-2009, Cromaglass systems were installed and serviced exclusively by Mid-State Electric, Cromaglass' authorized treatment system installation and servicing contractor. Cromaglass Corporation discontinued using Mid-State as its serving agent and until going out of business, was servicing the units directly. Cromaglass is reportedly no longer servicing its treatment units. Pursuant to the CMP, owners of existing Cromaglass units may contract with service providers that hold a NJDEP public wastewater treatment system operator's license at the S2 level or higher. Alternately, these homeowners may elect to replace the Cromaglass treatment tank with a conventional septic tank that meets the requirements of N.J.A.C 7:9A-8.2.

Bio-Microbics, the manufacturer of the FAST and BioBarrier systems, has designated Site Specific Design, Inc. as its authorized service agent for the servicing of the FAST and Bio Barrier technologies. Site Specific Design has not reported the occurrence of alarm events during the current reporting period. The firm has previously repaired or replaced airlifts on 11 previously installed FAST systems and extended recycling troughs on five systems to enhance the return of nitrified wastewater to the unit's anoxic chambers. Subsequent to these system repairs, the firm has addressed airlift issues during eight subsequent system installations. After system modifications, the Bio-Microbics FAST system has achieved an overall median total nitrogen concentration of 18.2 mg/l in treated effluent, leading to its permanent authorization on 1.4-acre parcels.

Bio-Microbics is required, under the terms of the pilot program, to trouble shoot the inadequate nitrogen attenuation performance of existing BioBarrier systems and must do so until the existing systems achieve total nitrogen concentrations of less than or equal to 14.0 mg/l. While the manufacturer has undertaken such remedial actions, the technology's performance has not improved. As a result, **Commission staff has recommended that BioBarrier's participation in the pilot program be discontinued and as noted, the Commission has proposed a CMP amendment to implement that recommendation.**

SeptiTech, the manufacturer of the SeptiTech technology has designated both Site Specific Design, Inc. and South Jersey Engineers as authorized service agents to provide operation and maintenance service on SeptiTech systems. The authorized service agents working with the system manufacturer were able to identify software programming errors that caused the technology to discharge effluent containing higher concentrations of nitrogen than required for use on one-acre parcels. Once those programming errors were identified and corrected, the technology has been shown to be capable of meeting Pinelands water quality standards and has now been recommended for permanent approval.

In addition to the servicing agents that are authorized by the technology manufacturers, both the Commission's and NJDEP's rules authorize individuals that possess a S2 or higher NJ Wastewater Treatment Plant Operator's License to provide operation and maintenance services on the Pinelands pilot program systems.

Cost Summary

The pilot program requires the collection and reporting of cost data for each treatment technology. To facilitate monitoring of treatment system costs, the CMP requires the technology vendors to report the cost of each individual treatment system installation to the Commission.

The total cost of an onsite wastewater treatment system consists of at least three components. These include the cost of the treatment unit, its installation and its five-year service package, the cost of the soil absorption system and its installation (e.g., excavation, replacement soil, stone and pipe), and the cost of engineering, surveying, and other permit and inspection services. The treatment unit manufacturers can readily provide the Commission with information on the cost of their equipment and related support services, which in the case of the Pinelands pilot program includes a five-year maintenance contract, five-year warranty, and three years of quarterly effluent analysis (for systems being piloted). The vendors, however, do not have direct knowledge of the cost of the soil absorption field installation, other installation and labor costs, or the cost for engineering (soil testing, system design, as-built plans, etc.) of the system. This site-specific information is typically supplied by the homeowner or builder to the treatment system vendor who in turn supplies it to the Commission.

Table 4 on the following page summarizes average treatment system costs based upon information provided to the Commission by the system vendors, as supplemented by the homeowner or builder. Actual treatment unit costs, including equipment, five-year operation and maintenance service contracts, five-year warranties and the three-year sampling program have remained relatively stable or have declined since the inception of the pilot program. Both F.R. Mahony and AquaPoint report that they have lowered the cost for their equipment since having attained permanent approval status and the discontinuation of required wastewater effluent sampling and reporting to the Commission. Figure 3 provides system cost comparisons during 2006, 2009, 2012, 2017 and 2019, the years in which pilot program implementation reports were issued.

Annual fluctuations in the average total system installation cost (including construction related expenses) have occurred since the inception of the pilot program. This variability is generally attributable to differences in the cost of non-treatment unit components, including material quantities and labor that vary on a system by system basis. Rarely are two individual system designs and material quantities identical. Variability in the cost and quantity of replacement soil, (select fill) stone aggregate, pipe, geo-textiles, labor, excavation, trucking, engineering, etc.) is common on a system by system basis. As a rule, larger and deeper systems typically cost more to construct than smaller, shallower systems. Average overall costs will be higher in a year in which a greater number of larger systems were installed than in a year when a greater number of smaller systems were built.

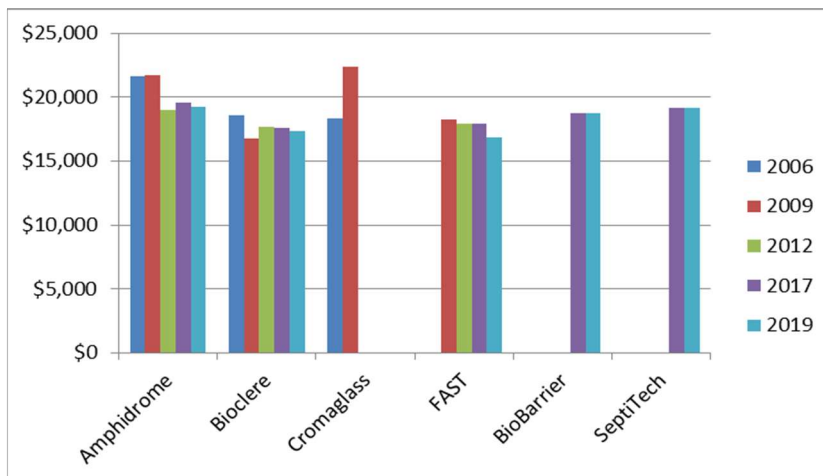
Table 4. Average Total Cost of Pinelands Alternate Design Wastewater Treatment Systems

Note: Cost information is derived from a variety of sources and should be viewed as approximate.

Name of Treatment System Technology	No. of Systems included in this cost analysis	Average Reported Cost per Treatment Unit with 5 year warranty and 5 year operation and maintenance service.	Average Reported Cost for Engineering, Soil Absorption Field Installation, Electrical Connections, etc. ⁽⁸⁾	Average Reported Total Cost of the Advanced Onsite Treatment Systems
Amphidrome	78	\$18,944	\$12,171	\$31,115 ⁽¹⁾
Bioclere	64	\$17,384	\$10,103	\$27,487 ⁽²⁾
Cromaglass	42	\$23,553	\$11,712	\$ 35,265 ⁽³⁾
FAST	30	\$16,468	\$11,514	\$27,990 ⁽⁴⁾
BioBarrier	13	\$18,744	\$10,031	\$28,775 ⁽⁵⁾
SeptiTech	38	\$18,960	\$8,961	\$27,921 ⁽⁶⁾
Busse GT ⁽⁷⁾	N/A	\$24,000 (est.)	N/A	N/A
Hoot ANR ⁽⁷⁾	N/A	\$14,500 (est.)	N/A	N/A

- 1) Based on the reported cost of the Amphidrome system during the period of 2004 through June 2020.
- 2) Based on the reported cost of the Bioclere system during the period of 2005 through June 2020.
- 3) Based on the reported cost of the Cromaglass system during the period of 2005 through 2010, the last year of installation.
- 4) Based on the reported cost of the FAST system during the period of 2008 through June 2020.
- 5) Based on the reported cost of the BioBarrier system during the period of 2015 through June 2018, the last year of installation.
- 6) Based on the reported cost of the SeptiTech system during the period of 2014 through June 2020
- 7) As provided by the system vendor. No Busse GT systems have been installed and although one Hoot ANR system has been installed, cost information for that system has not yet been provided to the Commission.
- 8) Includes reported cost of the treatment system, treatment tanks if not supplied by system vendor, engineering, excavation, electrical, and effluent dispersal field components and system installation.

Figure 3. Average Total Comparative Cost of Pinelands Alternate Design Wastewater Treatment Systems during 2006, 2009, 2012, 2017, and 2019 the years in which pilot program implementation reports were issued. Note: Cost information is derived from a variety of sources and should be viewed as approximate.



Treatment System Nitrogen Attenuation Summary

The pilot program requires that the technology suppliers arrange for samples of treated effluent to be collected from each system on at least a quarterly basis [approximately every ninety (90) days] for at least three years, yielding a total of at least 12 samples per system. Pursuant to the pilot program sampling and testing protocols, samples of treated effluent are collected from a sample collection port located between the treatment unit and the soil dispersal field. Sample procurement must comply with the latest version (currently Aug. 2005 with updates through April 2011) of the NJDEP Field Sampling Procedures Manual. The laboratory analysis of effluent samples must be performed by laboratories certified by the NJDEP employing analytical methodologies accepted by NJDEP. To permit the establishment of microbial cultures necessary for the treatment process to develop and stabilize, no samples are required during the first ninety days from system start-up. In most instances, technology vendors have adjusted sampling schedules to provide for more efficient, synchronized sample collection from multiple systems.

As noted previously, a total of 346 Pinelands alternate design wastewater treatment systems have been installed and activated in the Pinelands Area to date.

Amphidrome®



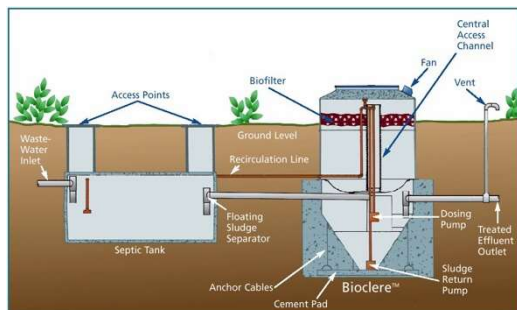
Amphidrome Technology

The Amphidrome process is an advanced biological treatment that utilizes an attached growth treatment concept and is an example of a biologically aerated filter system. This is a patented treatment system. The system is pre-engineered and designed for the removal of soluble organic nitrogen, and for the nitrification and denitrification processes to occur simultaneously in a single reactor. The process begins operating in an aerobic mode and gradually progresses to an anoxic mode. The cyclical action is created by allowing a batch of wastewater to pass from the anoxic/equalization tank through the granular biological filter into the clear well. The batch of wastewater is then pumped back from the clear well up through the filter, where it overflows into a trough that carries it back to the anoxic/equalization tank. These cycles are repeated multiple times, while the treatment is allowed to progress from aerobic to anoxic conditions within the filter. Once sufficient cycles have been repeated to ensure the degree of treatment required, a batch of effluent is discharged. A control system operates the system based on predetermined settings. The Amphidrome reactor consists of: an underdrain, support gravel, filter media, and backwash trough. The underdrain is located at the bottom of the reactor and provides support for the media and distribution of liquid into the reactor during a reverse flow or backwash. It is also designed as a manifold to distribute air evenly over the entire filter bottom during the aerobic portion of the cycle. On top of the underdrain is approximately 18" of gravel. Several layers of different size gravel are used. Above the gravel is a deep bed of coarse, round silica sand. The deep bed filter design employed in this manner significantly reduces suspended solids and allows for adequate growth of microorganisms for treating wastewater. In order to achieve the necessary degree of nitrogen reduction under a wide range of conditions, this system is equipped with chemical addition pumps that allow the addition of alkalinity for nitrification and/or methanol for denitrification, when necessary.

The Amphidrome technology is no longer subject to effluent TN concentration analysis and reporting as a result of its successful release from the pilot program. It is now authorized for permanent use one minimum one acre parcels subject to the provisions of N.J.A.C 7:50-6.84(a)5iv(3). Table 5 provides the running median and grand median values for

total nitrogen concentrations (mg/l) from 68 monitored Amphidrome units. The Amphidrome technology produced a grand median total nitrogen concentration of **11.9 mg/l**, satisfying the Commission's 14.0 total nitrogen standards for use on minimum one-acre parcels.

Bioclere

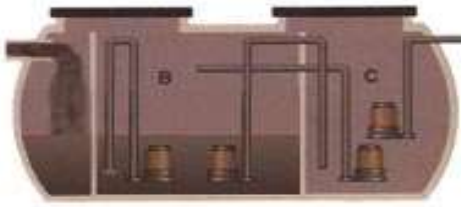


Bioclere Technology

The Bioclere system utilizes an attached growth trickling filter concept for wastewater treatment for residential or commercial facilities. A trickling filter typically consists of a bed of highly permeable media to which microorganisms are attached and through which wastewater is percolated. The Bioclere unit utilizes a patented plastic media in a randomly packed configuration. The incoming wastewater is passed from the primary settling tank to a baffled area in the sump of the Bioclere in which a dosing pump is located. The dosing pump doses the trickling filter at a predetermined frequency. A forced draught ventilation system provides adequate airflow for maintaining aerobic conditions in the trickling filter. In the trickling filter unit, the organic material present in the wastewater is degraded by microorganisms attached to the filter media. Organic material from the wastewater is converted into bio-mass or a slime layer. As the organisms grow, the thickness of slime layer increases and diffused oxygen is consumed before it can penetrate the full depth of the slime layer. Thus, an anaerobic condition is developed near the surface of the media and the microorganisms near the surface of the media enter into an endogenous phase of their growth and lose their ability to cling to the media. Eventually, the wastewater washes the slime off the media while a new slime layer starts establishing and the process continues. The excess bio-mass or the slime would settle in the bottom and the sludge return pump would pump it back to the primary settling tank. Sludge return also acts to combine nitrates to with a carbon source in the primary tank, facilitating denitrification and achieving a reduction in total nitrogen concentration.

The Bioclere technology is no longer subject to effluent TN concentration analysis and reporting as a result of its successful release from the pilot program. It is now authorized for permanent use on minimum one acre parcels subject to the provisions of N.J.A.C 7:50-6.84(a)5iv(3). Table 6 provides the running median and grand median values for total nitrogen concentrations (mg/l) from 38 monitored Bioclere units. The Bioclere technology produced a grand median total nitrogen concentration of **11.2 mg/l**, satisfying the Commission's 14.0 total nitrogen standards for use on minimum one-acre parcels.

Cromaglass



Cromaglass Technology

In August 2013, the Executive Director recommended that the Cromaglass technology be removed from the Pilot Program entirely, with no further installations permitted. Prior to its permanent removal from the program, a temporary suspension barring new installations of the Cromaglass technology had been imposed in November 2006. This suspension came about as a result of the Commission's prior finding that the Cromaglass technology had not met CMP groundwater quality standards. The Cromaglass technology produced a grand median total nitrogen concentration of 31.5 mg/l, failing to meet the CMP's 14.0 mg/l total nitrogen standard for unsewered residential development on a minimum one acre parcel.

The Alternate Design Treatment Systems Pilot Program requires technology manufacturers to troubleshoot and remediate substandard treatment system performance. At the Commission's direction, Cromaglass undertook studies to determine the cause of inadequate nitrogen attenuation and recommended a number of remedial measures to improve nitrogen attenuation in its existing Pinelands treatment units. After reviewing Cromaglass' findings and recommendations, the Commission issued correspondence in 2011 requiring that Cromaglass implement a two-phase remediation program. Phase I was to include the retrofitting of 28 systems by March 1, 2012. Effluent sampling of the Phase I retrofit systems was to commence within two months of the completion of the Phase I retrofits and was to continue every two months for a total of six samples per system.

Cromaglass completed the Phase I retrofits by the March 1, 2012 deadline but did not fully comply with the system sampling requirements. The first-round samples were collected on May 2, 2012 and produced a grand median total nitrogen value of 18.0 mg/l. The second-round samples were collected five months later, included only 20 systems and resulted in a grand median total nitrogen value of 19.2 mg/l. In summary, Cromaglass was delinquent in sampling the retrofitted systems and failed to demonstrate the Cromaglass technology's capability to meet CMP water quality standards.

The Commission afforded the Cromaglass Corporation multiple opportunities to improve the technology's nitrogen attenuation. However, Cromaglass Corporation's inconsistent compliance with the pilot program's sampling and reporting requirements remained problematic. Further, the company failed to fully comply with the Commission's sampling and reporting requirements applicable to retrofitted Cromaglass units. The Commission therefore had no choice but to find that the Cromaglass Corporation's participation in the pilot program was not in substantial compliance with the sampling and reporting requirements of the CMP. Further the Cromaglass technology had not made satisfactory progress in attaining compliance with CMP water quality standards. **As a result, the Executive Director recommended, and the Pinelands Commission approved, the discontinuation of the Cromaglass technology's participation in the pilot program.**

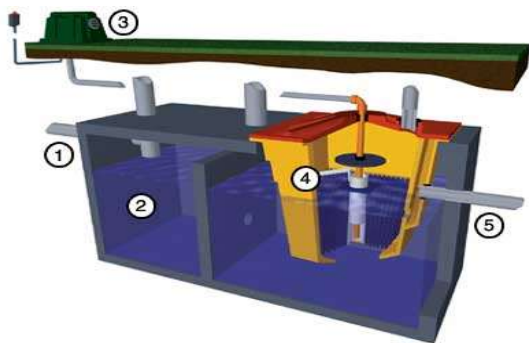
The Executive Director's recommendations were discussed at three public meetings of the CMP Policy & Implementation Committee in November 2012, February 2013 and August 2013. All the input that the Committee received at these public meetings was in support of the Pilot Program, its further extension and the removal of the Cromaglass technology. The Commission then proceeded to adopt amendments to the CMP in June of 2014 to implement the Executive Director's recommendations. Specifically, N.J.A.C. 7:50-2.11 was amended to remove the Cromaglass technology from the definition of "alternate design pilot program treatment system". Similarly, N.J.A.C. 7:50-10.21(c) and 10.22(a)3 were amended to reflect the removal of the Cromaglass technology from the pilot program. N.J.A.C. 7:50-10.22(a)4 and 10.23(i) were also amended to remove the Cromaglass technology.

The Cromaglass system is a Sequencing Batch Reactor (SBR) that is designed as a continuously fed activated sludge process with clarifiers that are operated on a batch basis. Treatment is achieved by turbulent aeration of incoming wastewater, and batch treatment of biomass (sludge) in a separate aeration and quiescent settling chamber within a single vessel. Cromaglass systems reportedly achieve denitrification with the addition of an anoxic cycle following aeration. Air and mixing are provided by submersible pumps with venturi aspirators that receive air through a pipe intake from the atmosphere. Anoxic conditions are created by closing the air intakes of aeration pumps with electric valves, thus stopping aeration but the system continues mixing. Per-batch cycling time is 120 to 240 minutes and there are five cycles to and discharge. The system is operated using a programmable logical control (PLC) that can store a record of all operational functions, thus providing information on each function of each cycle to the operator.

Table 7 presents sample results for 62 Cromaglass systems through July 5, 2010. Total reported nitrogen values for each of these Cromaglass systems represents the sum of reported laboratory values for total Kjeldahl nitrogen plus nitrite nitrogen plus nitrate nitrogen. The Cromaglass technology produced a grand median total nitrogen concentration of **31.5 mg/l**, failing to meet the Commission's 14.0 total nitrogen standard for unsewered residential development on a minimum one-acre parcel.

The Executive Director recommended, and the Pinelands Commission approved, a policy that allows homeowners who are using the Cromaglass technology to be given the option to continue to use it in a manner that is consistent with NJDEP's operation and maintenance requirements or, if they choose, to convert the system to function as a septic tank or to otherwise replace the Cromaglass tank with a conventional septic tank that meets the requirements of the NJDEP's Standards for Individual Subsurface Sewage Disposal Systems. The Commission can provide homeowners and septic system contractors with details on how a Cromaglass unit can be converted to function as a conventional septic tank.

FAST



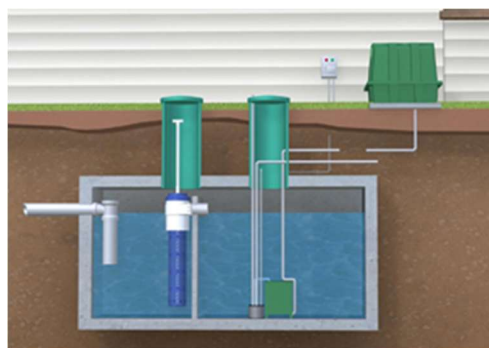
FAST Technology

The FAST (Fixed Activated Sludge Treatment) system is a pre-engineered modular system designed to treat wastewater from a single home, a group of homes, or commercial facilities. FAST is a fixed film, aerated system utilizing a combination of attached and suspended growth treatment principles capable of achieving nitrification and denitrification in a single tank. This combination offers the stability of fixed film media and the effectiveness of activated sludge treatment principles. A typical FAST system provides adequate volume for microorganisms in the aerated media chamber to treat wastewater. The attached growth system functioning on and around the plastic media assures that microorganisms remain inside the system instead of being flushed out, even during the peak hydraulic flow conditions. During the times of low flow, the large volume of thriving microorganisms prevents a dying-off of the system, making the system well suited to intermittent use applications.

The FAST technology is no longer subject to effluent TN concentration analysis and reporting as a result of its

successful release from the pilot program. It is now authorized for permanent use on minimum 1.4 acre parcels subject to the provisions of N.J.A.C 7:50-6.84(a)5iv(3). Table 8 provides the running median and grand median values for total nitrogen concentrations (mg/l) from 25 monitored FAST units. The FAST technology produced a grand median total nitrogen concentration of **18.2 mg/l**, demonstrating that it can meet the Commission’s 2 mg/l total nitrogen standard when used on minimum 1.4-acre parcels.

BioBarrier



BioBarrier Technology

The BioBarrier® MBR is a membrane bioreactor that combines activated sludge treatment processes with solids separation via membrane filter technology. The system employs flat sheet membranes with pore sizes ranging between of 0.02 to 1.4 μm . The membranes are housed in an aerated membrane cartridge that is submerged in the wastewater. The membranes provide a barrier that retains wastewater microorganisms within the treatment unit. The large mass of retained microbes provides an effective buffer against shock loadings to the system. The long microbial residence time in the treatment system allows the microorganisms to undergo endogenous respiration, reducing the total amount of solids produced by the treatment process.

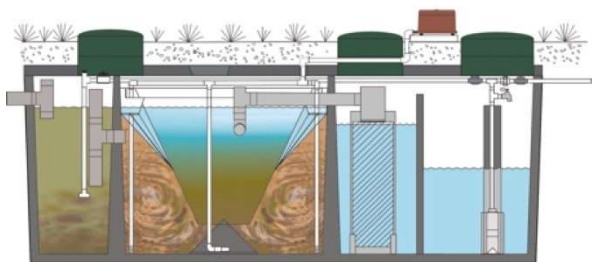
The system consists of a tank with three compartments. The first compartment provides primary treatment – sedimentation and separation of floatables and solids and is equipped with a proprietary outlet screening device. A solid wall separates the first compartment from the second, in which the system’s nitrogen reduction capabilities may be enhanced under anoxic conditions. The third compartment, the “aeration/membrane zone,” is separated from the anoxic zone by a baffle wall with openings between the two zones. The BioBarrier® Membrane module is in the third compartment. Aeration is provided to the third compartment by a blower that serves two functions. First, the blower provides mixing of the wastewater and biomass to allow complete contact between the bacteria and organic material in the wastewater, while supplying oxygen that is critical to the process. Second, the positioning of the aeration under the membrane sheets helps to remove solids that collect on the surface of the sheets. The membranes sheets, having microscopic pore size openings, separate the water from the solids in the aeration zone. An effluent pump provides a slight negative pressure on the “clean” side of the membrane, pulling filtered water through the membrane. The solids that are sloughed by aeration and membrane cleaning are retained in the aeration compartment.

As illustrated in Table 9, sample results have been evaluated from 13 BioBarrier systems to date. A total of 195 samples have been used to evaluate these 13 BioBarrier systems. Total nitrogen (TN) values for each of the BioBarrier systems represents the sum of reported laboratory values for total Kjeldahl nitrogen plus nitrite nitrogen and nitrate nitrogen. The BioBarrier technology produced a grand median total nitrogen concentration of **29.5 mg/l** based upon all samples to date. This grand median total nitrogen value is higher than the 24.9 mg/l TN concentration presented in the Commission’s 2018 annual report. As previously noted, the technology must attain a grand median total nitrogen concentration no greater than 14.0 mg/l in order to meet Pinelands water quality standards when used to serve residential development on a minimum one-acre parcel.

The BioBarrier technology has not been demonstrated to be capable of meeting the 14.0 mg/l TN concentration

requirement necessary for use on one-acre parcels. Accordingly, on October 3, 2016, the Commission imposed a restriction on the future use of the BioBarrier system, requiring that it be limited to parcels containing at least 1.7 acres, (subject to increase or decrease based upon additional sampling data), as determined by the Pinelands Septic Dilution Model. At that time, Bio-Microbics instituted a voluntary moratorium on the sale and installation of all new BioBarrier systems in the Pinelands Area effective February 2015. BioMicrobics, the technology vendor has undertaken efforts to troubleshoot the operation of the system and instituted a homeowner education program aimed at eliminating the use of cleaning products containing quaternary ammonia, a nitrogen-based sanitizer known to disrupt biological nutrient reducing wastewater treatment processes. Notwithstanding these measures, the BioBarrier has not been shown to be capable of meeting Pinelands water quality standards on lots that are smaller than 2.2 acres when factoring in testing performed after October 2016. As a result, Commission staff has recommended that BioBarrier's participation in the pilot program be discontinued and as noted, the Commission has proposed a CMP amendment to that effect.

HOOT



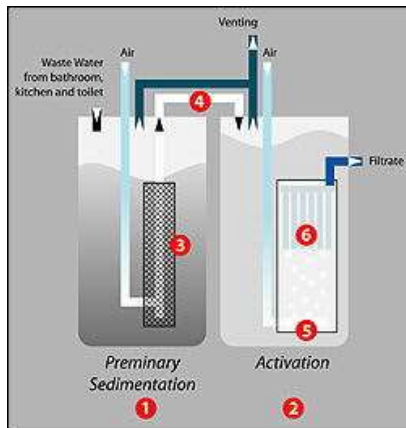
Hoot ANR Technology

The Hoot ANR treatment system is an extended aeration/activated sludge treatment process coupled with anaerobic denitrification. The unit is comprised of five principal components, a Pretreatment Tank, Aeration Chamber, Clarifier, Media Tank and Final Clarifier/Pump Tank.

The Pre-Treatment tank provides separation and anaerobic digestion of influent solids and functions much like a septic tank by reducing up to 50% Total Settable Solids (TSS) and approximately 25% of Biochemical Oxygen Demand (BOD5). Liquid waste flows out of the pretreatment tank through a baffled outlet and into the aeration chamber. The activated sludge treatment process occurs in the aeration chamber through the introduction of oxygen into the mixed liquor to enable the conversion of soluble material into biomass. In addition, oxygen enables nitrifying bacteria to convert ammonia-nitrogen to nitrate-nitrogen. Wastewater then flows to a clarifier for additional solids settling. From the clarifier, wastewater is transferred to a media tank where an attached growth treatment process occurs. Here, a proprietary carbon source is added. In the presence of the supplemental carbon source, denitrifying bacteria release free nitrogen to the atmosphere. A final clarifier/pump tank constitutes the last treatment component before discharge to the soil absorption field. A portion of the daily flow of the system is recirculated from this chamber to the pre-treatment tank where it is reprocessed through the system. As there are currently no Hoot ANR systems operating in the Pinelands Area, the Commission has no performance data to report currently.

The first Pinelands Area Hoot ANR system was being installed in Jackson Township, Ocean County during the preparation of this report. The future performance of the Hoot technology will be the subject of future reports to the Commission.

Busse GT



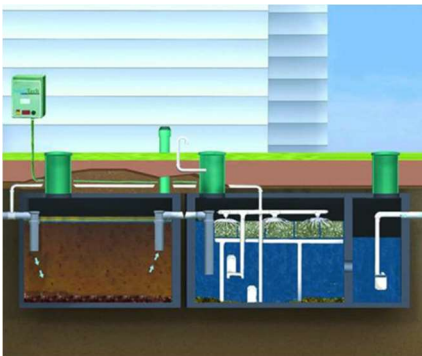
Busse GT MBR Technology

The Busse Innovative Wastewater Treatment System is a small-scale membrane bioreactor. The Busse system provides treatment in a three-stage, four-tank process. Wastewater enters an intermittently aerated first tank and is then transferred by an airlift through a mesh filter to an identical second tank. Wastewater in the second tank is divided evenly between two membrane tanks, again with a screened airlift transfer. The membrane bioreactor tanks house 24 Kubota flat-sheet membranes. The Kubota membranes units are comprised of two sections: the lower section contains the air piping and the upper section contains the membrane panels. The membrane units are submerged in activated sludge within the reactor tanks. The tanks are aerated by coarse and fine bubbles that provide a cross flow of liquid over the surface of the membrane panels. Cross flow circulation reduces membrane fouling and provides oxygen for microbial degradation of wastewater organics. The liquid head above the membrane drives permeate from the wastewater mixture through the membrane, where it flows via a manifold through the tank wall and is discharged. A return sludge airlift is activated by a programmable logic controller and is controlled by level sensors located in tanks two through four. A third air pump provides aeration to the airlifts in the first two tanks.

The bioreactor provides an aerobic environment where microorganisms present in the wastewater remove soluble contaminants, using them as a source of energy for growth and production of new microorganisms. The organisms flocculate and form aggregations that further physically entrap particulate organic matter. The organic matter is attacked by extracellular enzymes that solubilize the solids to make them available to the microorganisms as a food source. The conversion of the organic matter from soluble to biological solids allows for removal of the organic matter by settling and filtration of the solids in the treatment process. As there are currently no Busse GT systems operating in the Pinelands Area, the Commission has no performance data to report at this time.

Because the manufacturer has not installed any systems in the Pinelands Area since originally being approved to participate in the pilot program in September 2011, Commission staff has recommended that Busse GT's participation in the pilot program be discontinued. The Commission formally proposed amendments to implement that recommendation in July 2020.

SeptiTech



SeptiTech Technology

The SeptiTech® wastewater treatment system is a two-stage treatment technology, based on a fixed film trickling filter, using a patented highly permeable hydrophobic media. The first stage of treatment occurs in the primary tank in which the solids are settled and partially digested. The second stage of the system is a processor that provides secondary wastewater treatment. Microorganisms present in the wastewater grow within the media, using nutrients and organic materials provided by the constant supply of fresh wastewater to form new cell mass. Air is drawn into the system via an air intake pipe at the top of the SeptiTech® System. Venturis located in the sprinkler head distribution piping aerate the wastewater sprayed onto the media. The system operates without a fan or compressor.

The SeptiTech® System is designed to remove total nitrogen from wastewater by nitrification and denitrification. Nitrification occurs in the second stage of the system, where ammonia–nitrogen is converted to nitrite and nitrate (predominately nitrate), while denitrification occurs in the anaerobic/anoxic primary tank. Denitrification also occurs in a stacked media module that floats in the reservoir below the aerobic media.

Wastewater from the primary tank flows by gravity to the processor reservoir section, located below the filter media. The second and third pumps are used to return wastewater and solids from the reservoir back to the primary tank. The fourth pump is used to discharge treated wastewater to the disposal location.

As illustrated in Table 10, sample results have been evaluated from 35 SeptiTech systems to date. A total of 304 samples have been collected from these 35 SeptiTech systems producing a grand median total nitrogen concentration of **11.6 mg/l**. The total nitrogen (TN) values for each of the SeptiTech systems represents the sum of reported laboratory values for total Kjeldahl nitrogen plus nitrite nitrogen and nitrate nitrogen. This post-reprogramming data value of 11.6 mg/l TN demonstrates that the SeptiTech technology has been shown to be capable of must a grand median total nitrogen concentration no greater than 14.0 mg/l as required to meet Pinelands water quality standards when used to serve residential development on a minimum one acre parcel.

Because the SeptiTech technology has been shown to be capable of meeting the 14.0 mg/l TN standard, Commission staff is recommending that the SeptiTech technology be advanced from the pilot program and authorized for permanent use on minimum one-acre parcels subject to the provisions of N.J.A.C 7:50-6.84(a)5iv(3). The Commission formally proposed amendments to the CMP to permanently approve the SeptiTech technology for use on one-acre parcels in July 2020.

Household Variability and Concentration vs. Mass Loading

When evaluating data from single family wastewater treatment systems, it is important to recognize that the number of home occupants, water use, pharmaceutical use and cleaning and laundry product usage may vary greatly from one

residence to another. These and other variables can markedly impact the concentration of nitrogen in wastewater and can adversely affect the ability of a treatment system to meet established discharge limits. The number of individuals occupying a dwelling can result in abnormally high or low levels of nitrogen in wastewater given that each person contributes approximately 9 lbs. of nitrogen to the system annually. Water conservation, while encouraged and desirable, has the potential to cause higher concentrations of pollutants in the wastewater (but not greater mass loading) because less water is available to dilute the pollutants. As a result of significant advances in water conservation, including the use of water conserving fixtures and appliances as well as behavior modifications, assumed values for total nitrogen concentration in domestic effluent, established during the 1960's and 1970's at approximately 40 mg/l, may under-estimate the actual average TN concentration in domestic wastewater streams. It is important to note however, that estimates of the total mass of nitrogen expelled by humans remain constant at approximately 9 lbs. per person per year. It is evident from wastewater analyses conducted for the pilot program that there is a wide range in the concentration of total nitrogen in septic tank effluent. However, even if the concentration of nitrogen in domestic wastewater frequently exceeds 40 mg/l, the total mass of nitrogen is likely consistent with estimated values used in the Pinelands septic dilution model. As a result, even where effluent values exceed assumed post treatment concentrations, system discharges may still be meeting total nitrogen mass loading targets, even if the observed concentrations do not.

At the outset of the pilot program, four of the five original treatment technologies (Amphidrome, Bioclere, Cromaglass and FAST) were assigned an estimated total nitrogen removal efficiency of 65%. The fifth technology (Ashco RSF^{III}) was assigned an estimated total nitrogen removal efficiency of 50%. The four new technologies added to the pilot program in 2013 (BioBarrier, Busse GT, Hoot ANR and SeptiTech) each have an assumed nitrogen removal efficiency of 65% based upon third party certifications. Using these estimates, if the total nitrogen contained in the raw influent is 40 mg/l, a 65% reduction would result in a concentration of 14 mg/l in the treated effluent (and a 50% reduction would result in a concentration of 20 mg/l). These effluent concentrations would be reduced to 2 mg/l at the parcel line of a one acre lot based upon the Pinelands septic dilution model. Similarly, if influent nitrogen levels range up to 80 mg/l, the same 65% removal efficiency would result in effluent concentrations of 28 mg/l. By monitoring only the effluent concentration and determining that it meets the required 14 ppm, the pilot program is able to conservatively ensure compliance with the Commission's 2 mg/l standard at the parcel boundary without regard to influent concentrations.

Use of certain cleaning (sanitizing) and laundry products as well as the use of certain medications can stress the bacteria that provide biological nitrification and denitrification. Because of this, education of system users is an important component of any wastewater management program.

In recognition of these factors, all of the alternative treatment system vendors have developed homeowner user manuals that provide critical information to the owners of the alternative treatment systems. In addition, several vendors have developed and provided system owners with questionnaires that are aimed at identifying laundry and cleaning product usage and any other condition that might lead to non-compliant sample results. Staff encourages all of the technology vendors to collect and analyze this type of information to better understand user characteristics and to enhance compliance with effluent discharge limits.

Effluent Monitoring Data

Effluent sampling data submitted to date have been analyzed and presented in this report. Tables 5, 6, 7, 8, 9 and 10 provide the running median and grand median values for total nitrogen concentrations (mg/l)¹ and the number of samples taken for the Amphidrome, Bioclere, Cromaglass, FAST, BioBarrier and SeptiTech wastewater treatment systems respectively. The Commission does not have effluent monitoring data for the Busse GT and Hoot wastewater systems. The analysis indicates a grand median of 11.9 mg/l for the Amphidrome system and 11.2 mg/l for the Bioclere system. Both grand median concentrations are below the 14 mg/l target, which is based upon the Pinelands septic dilution model and an influent concentration of approximately 40 mg/l. These technologies have been granted permanent approval status for residential use on minimum 1-acre parcels and are no longer subject to required effluent TN analysis and reporting. The TN grand median concentration for the Cromaglass system is 31.5 mg/l, and as a result of this value and Cromaglass Corporation's failure to comply with the requirements of the pilot program, new installations of the Cromaglass technology are no longer permitted in the Pinelands Area. The TN grand median concentration for the FAST system is 18.2 mg/l. While not meeting the

¹ One (1) mg/l = one (1) ppm

Commission's required TN concentration for residential use on one-acre parcels, the FAST system has been demonstrated to meet the Commission's water quality standard if used on minimum 1.4-acre parcels. As noted, the FAST system has been advanced from the pilot program and is now permanently approved for residential use on minimum 1.4-acre parcels. BioBarrier has produced a TN grand median concentration of 29.5 mg/l. Commission staff has recommended that this technology be eliminated from the pilot program. SeptiTech has produced a TN grand median concentration of 11.3 mg/l when samples affected by a system programming error are excluded. Commission staff has recommended that the SeptiTech system be permanently approved to serve residential development on one-acre parcels in the Pinelands Area.

Table 5. Amphidrome running median of total nitrogen (mg L-1) by number of sampling events for each wastewater treatment system. The grand median, 25th percentile, 75th percentile, and number of systems sampled (N) per event are provided. (See Appendix 1 for discussion of data editing.)

Total Nitrogen Running Median

Technology	System	Number of Sampling Events													Grand Median		
		1	2	3	4	5	6	7	8	9	10	11	12	13			
Amphidrome	1	18.5	25.3	32.1	25.3	20.7	19.6	18.5	17.7	16.9	16.0	16.9					18.5
Amphidrome	2	9.5	9.1	9.4	9.5	9.5	9.7	9.5	9.5	9.4	9.4	9.4	9.5		9.5		9.5
Amphidrome	3	18.4	12.1	18.4	50.4	18.4	14.9	12.6	12.0	11.5		12.0	12.6	12.9			12.7
Amphidrome	4	35.2	29.2	23.2	16.4	9.7	8.4	7.8	7.5	7.2	7.5	7.8	7.6				8.1
Amphidrome	5	10.0	42.3	51.3	31.8	12.3	31.8	17.8	16.0	15.8	16.8	15.8	16.2	15.8			16.2
Amphidrome	6	6.0	33.8	6.9	9.8	12.7	14.8	12.7	11.1	9.5	11.1	12.1	10.8				11.1
Amphidrome	7	12.7	11.8	11.0	9.2	8.5	9.6	9.5	10.1	10.7	10.8	10.7	10.1				10.4
Amphidrome	8	15.2	19.3	15.2	12.1	9.1	9.5	9.1	9.0	8.9	9.0	8.9	8.7				9.1
Amphidrome	9	143.9	79.5	15.1	12.5	9.8	10.1	10.3	10.1	9.8	10.1	10.3	10.1	10.3		10.3	10.3
Amphidrome	10	5.8	4.9	5.8	6.6	7.0	6.7	7.0	7.1	7.0	7.2	7.3					7.0
Amphidrome	11	14.9	10.1	6.0	8.4	10.8	12.2	10.8	9.8	10.0	9.5	8.9	8.4				9.9
Amphidrome	12	18.8	27.6	36.4	33.6	36.4	38.3	36.4	33.6	30.8	24.8	30.8					33.6
Amphidrome	13	4.7	5.4	4.7	5.2	5.7	5.2	5.3	5.5	5.7	5.8	5.7	5.8				5.4
Amphidrome	14	24.5	17.2	9.8	9.7	9.5	9.4	9.4	9.4	9.5	9.4						9.5
Amphidrome	15	4.0	6.3	5.3	5.4	5.3	5.4	5.5	5.4	5.5	5.7	5.9					5.4
Amphidrome	16	11.7	16.7	11.7	11.4	11.2	11.4	11.7	12.5	13.3	12.5	11.7	11.8				11.7
Amphidrome	17	27.0	47.2	58.2	56.5	54.8	54.5	54.2	54.0	53.8	53.1	52.3					54.0
Amphidrome	18	11.1	12.9	11.1	10.3	9.4	10.3	11.1	11.8	12.3	12.4	12.3	12.1	11.9			11.8
Amphidrome	20	16.0	13.4	16.0	14.9	16.0	14.9	16.0	14.9	13.9	14.9	16.0					14.9
Amphidrome	21	7.5	8.1	8.8	10.3	11.9	13.0	11.9	10.6	11.9	13.0	14.0					11.9
Amphidrome	22	36.8	49.3	55.0	45.9	36.8	28.1	19.5	19.4	19.5	23.0	26.6					28.1
Amphidrome	23	25.4	16.2	11.0	10.3	11.0	11.3	11.6	11.9	12.3	11.9	11.6	11.5	11.5			11.6
Amphidrome	24	7.3	5.7	6.5	6.9	6.5	6.2	6.5	6.9	7.3	6.9						6.7
Amphidrome	25	11.6	13.5	15.3	15.7	15.9	16.0	16.1	16.4	16.1	16.4	16.8	16.4	16.8			16.1
Amphidrome	26	14.2	19.1	23.9													19.1
Amphidrome	28	23.9	32.6	41.4	32.6	23.9	23.3	23.9	23.3								23.9
Amphidrome	29	7.6	17.6	7.6	9.1	7.6	7.5	7.6	7.5	7.4	6.8	6.3					7.6
Amphidrome	30	97.1	53.2	9.3	9.0	9.3	9.9	9.3	9.0	9.3	9.9	9.3	9.0	9.3		9.3	9.3
Amphidrome	31	11.8	13.5	12.3	12.9	13.5	12.9	12.3	12.6	12.3	12.3	12.3	12.1				12.3
Amphidrome	32	7.4	7.7	8.0	11.3	8.0	9.8	8.0	7.7	7.4	7.7						7.8
Amphidrome	33	6.4	5.0	6.4	6.0	6.4	6.3	6.1	6.3	6.4	6.5	6.6					6.4
Amphidrome	34	13.9	20.0	13.9	18.3	18.3	16.1	18.3	20.5	22.7	20.5	18.3					18.3
Amphidrome	35	9.0	11.5	13.9	16.0	13.9	12.8	13.9	16.0	13.9	16.0	18.1					13.9
Amphidrome	36	11.7	12.9	13.6	12.9	13.6	13.8	14.1	14.1	14.1	14.1	14.1	13.8				13.8
Amphidrome	37	9.9	9.5	9.9	10.8	11.7	11.2	10.6	11.2	11.7	11.3	11.7	11.8	11.7			11.2
Amphidrome	38	17.3	13.9	10.5	13.2	10.5	9.1	7.7	7.0	7.7							10.5
Amphidrome	41	27.4	26.7	25.9	26.7	25.9	22.0	19.1	18.6	19.1	19.1						24.0
Amphidrome	43	17.2	17.5	17.2	17.5	17.8	19.0	20.1	19.0	17.9	18.1	18.3	18.5	18.7			18.1
Amphidrome	44	11.9	13.6	15.3	15.9	16.5	15.9	15.3	15.1	15.0	13.4	13.7	14.3				15.1
Amphidrome	45	26.6	16.7	20.4	22.9	20.4	14.9	15.4	12.4	9.5	9.5	9.6	10.2	10.9			14.9
Amphidrome	46	9.0	9.7	10.4	10.9	10.4	10.4	10.4	10.4	10.4	10.8	10.4					10.4
Amphidrome	47	15.2	16.2	15.2	13.5	11.8	13.5	11.8	11.8	11.8	11.8	11.8					11.8
Amphidrome	48	37.6	28.3	24.2	23.8	24.2	23.8	23.4	23.8	24.2	23.8						24.0
Amphidrome	49	12.0	21.5	14.7	15.0	15.2	16.8	15.2									15.2
Amphidrome	50	22.9	19.0	22.9	25.1	27.3	25.6	23.9	25.6	23.9	23.4						23.9
Amphidrome	51	82.0	75.1	68.2	39.1	22.5	17.0	12.6									39.1
Amphidrome	53	12.0	13.9	12.6	12.3	12.0	10.0	12.0	10.1								12.0
Amphidrome	54	9.8	9.5	9.3	9.5	9.3	9.5	9.8									9.5
Amphidrome	55	23.2	18.6	16.6	15.3	14.0	14.0										15.9
Amphidrome	56	18.3	28.7	20.9	27.8	20.9	27.8										24.4
Amphidrome	57	56.0	50.7	56.0	52.5	49.0											52.5
Amphidrome	58	31.8	38.3	31.8	22.0	15.1											31.8
Amphidrome	59	28.1	30.6	33.0	32.6	32.3											32.3
Amphidrome	60	18.1	15.6	14.2	16.1	18.1	16.1										16.1
Amphidrome	61	6.7	7.9	7.2	8.2	8.2	8.1										8.0
Amphidrome	62	3.7	9.7	12.6	9.5												9.6
Amphidrome	63	5.9	6.0	6.0	8.6												6.0
Amphidrome	64	8.3	8.7	9.1	8.7												8.7
Amphidrome	65	48.0	27.3	47.5	29.2	34.4											34.4
Amphidrome	66	13.1	41.4	51.4	37.3												39.4
Amphidrome	67	18.8	15.8	16.1													16.1
Amphidrome	68	10.0	9.4	10.0													10.0
Amphidrome	69	52.1	30.5														41.3
Amphidrome	70	25.5															25.5
Amphidrome	71	5.8	7.7	6.3													6.3
Amphidrome	72	36.0	38.8														37.4
Amphidrome	73	24.2	22.4	20.5													22.4
Amphidrome	74	7.2															7.2
Sample # Median		14.6	16.5	14.0	13.2	12.7	12.9	11.9	11.8	11.7	11.8	11.8	11.5	11.7			11.9
25th Percentile		9.4	9.8	9.4	9.6	9.5	9.6	9.5	9.3	9.3	9.4	9.3	9.5	10.6			9.5
75th Percentile		24.7	28.1	23.0	24.4	19.4	16.4	16.0	16.1	15.6	16.1	15.9	12.6	14.3			16.1
n		68	66	64	59	55	51	47	44	42	40	35	21	11			

Table 6. Bioclere running median of total nitrogen (mg L-1) by number of sampling events for each wastewater treatment system. The grand median, 25th percentile, 75th percentile, and number of systems sampled (N) per event are provided. (See Appendix 1 for discussion of data editing.)

Total Nitrogen Running Median		Number of Sampling Events												Grand Median	
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12		
Bioclere	1	22.3	13.4	8.8	8.9	8.8	7.8	8.8	7.8	7.8					8.8
Bioclere	2	10.7	9.8	8.9	9.8	8.9	9.8	10.7	10.8	10.7					9.8
Bioclere	6	17.0	11.4	17.0	12.7	14.4	13.3	12.2	10.3						13.0
Bioclere	7	10.4	14.9	10.4	10.2	10.4	10.8	10.4	10.2	10.1	10.2	10.4	10.8		10.4
Bioclere	8	11.2	9.6	10.5	9.3	8.6	9.6	10.5	9.6	10.4					9.6
Bioclere	9	8.6	8.4	8.6	9.5	10.4	10.7	10.4	9.5	10.4					9.5
Bioclere	10	8.4	8.4	8.4	9.9	9.2	9.7	10.1	9.8	9.6	9.5	9.4	9.5		9.5
Bioclere	11	25.0	17.8	15.4	13.2	15.4	13.2	13.8	14.6	13.8	12.4	10.9			13.8
Bioclere	12	52.8	55.5	52.8	33.0	13.1	12.3	13.1	12.3	13.1	12.3	13.1	13.5		13.1
Bioclere	13	14.2	14.2	14.2	11.4	11.9	11.1	11.9	11.5	11.1	11.2				11.7
Bioclere	14	16.2	24.7	16.2	17.1	16.2	14.5	12.9	12.2	11.4	11.0	10.7	11.0		13.7
Bioclere	15	5.2	13.2	10.6	13.0	10.6	13.0	15.3	13.8	15.3	13.8				13.1
Bioclere	16	28.1	25.0	22.0	18.5	15.1	18.5	15.1	14.3	13.4	14.3	13.4	14.3		15.1
Bioclere	17	79.8	48.0	16.2	16.2	16.2	16.1	16.0	14.4	12.8	12.9	12.785			16.1
Bioclere	18	13.2	10.5	10.3	9.3	10.3	9.7	9.2	9.3	9.4	9.8	9.5	9.9		9.8
Bioclere	19	29.4	30.2	29.4	19.6	9.8	12.5	11.9	13.6	11.9					13.6
Bioclere	20	52.8	42.2	31.6	26.4	21.2	26.4	21.2	17.8	14.5					26.4
Bioclere	21	10.2	10.2	10.3	11.7	10.3	10.2	10.2	9.6						10.2
Bioclere	22	9.7	9.8	10.0	10.1	10.0	9.8	9.7	9.8	10.0	10.1	10.1			10.0
Bioclere	23	27.3	18.2	9.1	11.1	9.1	8.8	9.1							9.1
Bioclere	24	2.4	2.5	2.5											2.5
Bioclere	25	25.9	16.7	9.7	11.3	9.7	11.3	12.8							11.3
Bioclere	26	1.9	18.9	4.9	8.5	12.1	8.5	10.3							8.5
Bioclere	27	34.6	23.9	13.2	13.1	13.1	12.7	12.3							13.1
Bioclere	28	24.8	17.3	11.6	10.7	9.7	10.7								11.2
Bioclere	29	10.3	13.1	11.0	12.2	12.0									12.0
Bioclere	30	24.9	21.5	18.0	14.1	13.3									18.0
Bioclere	31	4.5	23.1	5.8	9.2										7.5
Bioclere	32	47.0	42.1	37.3	26.5										39.7
Bioclere	33	48.1	31.2	14.3	13.2	13.1									14.3
Bioclere	34	20.8	17.7	14.6	13.8										16.1
Bioclere	35	7.3	19.0	18.2											18.2
Bioclere	36	5.1													5.1
Bioclere	37	12.0													12.0
Bioclere	38	13.8													13.8
Bioclere	39	8.5													8.5
Bioclere	40	11.9													11.9
Bioclere	41	12.3													12.3
Sample # Median		13.5	17.5	11.3	12.0	10.6	11.0	11.9	10.8	11.1	11.2	10.7	10.9		11.2
25th Percentile		9.8	11.2	9.6	9.9	9.8	9.8	10.2	9.7	10.1	10.1	10.1	10.1		10.0
75th Percentile		25.7	24.1	16.4	14.0	13.2	13.0	13.7	13.1	13.1	12.6	12.8	12.9		13.1
n		38	32	32	30	27	24	23	19	17	11	9	6		

Table 7. Cromaglass running median of total nitrogen (mg L-1) by number of sampling events for each wastewater treatment system. The grand median, 25th percentile, 75th percentile, and number of systems sampled (N) per event are provided. (See Appendix 1 for discussion of data editing.)

Total Nitrogen Running Median		Number of Sampling Events												Grand Median	
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12		
Cromaglass	1	140.1	78.6	17.1	32.2	26.3	36.9	43.6	41.0	38.5	35.5	32.5			36.9
Cromaglass	2	49.0	45.0	49.0	45.0	49.0	45.0	41.0	43.8	44.9	43.0	44.9	43.0		45.0
Cromaglass	3	76.5	58.2	50.4	45.2	50.4	47.6	50.4	55.9	50.4	47.6	44.9	43.0		50.4
Cromaglass	4	77.2	55.7	77.2	64.4	77.2	83.6	78.8	78.0	77.2	69.1	61.0			77.2
Cromaglass	5	110.6	99.0	87.4	71.8	56.2	45.7	35.1	30.3	25.5	26.5	25.5			45.7
Cromaglass	6	61.6	44.7	47.3	39.0	47.3	50.0	52.7	50.0	47.3	47.3	47.3	47.7		47.3
Cromaglass	7	67.5	52.3	37.1	50.1	42.6	47.8	46.8	49.9	53.0	49.9	51.3			49.9
Cromaglass	8	85.5	61.9	38.3	37.0	38.3	39.9	40.7	41.1	40.7	41.1				40.7
Cromaglass	9	19.7	39.7	19.7	19.6	19.7	19.6	19.5	18.5	19.5	18.5	17.6			19.6
Cromaglass	10	58.5	61.3	58.5	42.2	25.9	23.0	20.1	18.1	20.1	18.1	20.1	18.634		21.5
Cromaglass	11	35.1	47.2	35.1	34.3	35.1	34.3	35.1	37.4	39.8	40.1	40.5			35.1
Cromaglass	12	30.6	26.5	22.5	19.5	22.5	26.5	22.5	19.5	16.5	15.0	13.6			22.5
Cromaglass	13	17.4	10.8	12.4	14.9	17.4	16.0	14.6	14.0	13.5	14.0	13.5	14.0		14.0
Cromaglass	14	31.7	28.7	31.7	30.9	30.0	29.9	29.7	27.7	25.8	26.6				29.8
Cromaglass	15	18.0	64.0	32.1	38.3	32.1	30.1	28.2	30.1	32.1	30.1	28.2			30.1
Cromaglass	16	25.5	17.1	14.4	17.2	14.4	14.3	14.2	14.3	14.2	13.3				14.4
Cromaglass	17	43.5	56.7	43.5	32.4	43.5	41.6	43.5	52.9	62.3	66.2				43.5
Cromaglass	18	104.4	85.3	66.1	57.6	66.1	60.6	56.3	55.7	55.2	52.1	49.0	40.9		56.9
Cromaglass	19	67.5	71.7	67.5	42.8	67.5	62.8	58.1	39.6	21.1	39.6	31.1	26.1		50.4
Cromaglass	20	46.3	32.5	18.6	15.2	18.6	28.8	39.0	31.2	23.4	27.3				28.1
Cromaglass	21	45.9	64.2	45.9	38.4	30.9	21.8	14.7	22.8	14.7	15.6	14.7	14.0		22.3
Cromaglass	22	57.6	49.7	41.7	31.0	41.7	40.2	41.7	40.2	38.7	38.2	37.8			40.2
Cromaglass	23	37.4	73.3	37.4	32.7	28.1	32.7	37.4	32.7	37.4	43.7	37.4	32.7		37.4
Cromaglass	24	31.8	32.6	33.5	32.6	31.8	31.2	30.6	28.0	25.5	19.5	24.8	19.2		30.9
Cromaglass	25	52.8	42.8	32.8	35.0	37.3	42.6	47.9	50.3	52.8	53.1				45.3
Cromaglass	26	74.3	68.7	63.2	43.5	23.7	20.2	16.8	16.5	16.8					23.7
Cromaglass	27	90.3	73.2	56.1	70.7	56.1	54.9	56.1	57.7	59.3	60.4				58.5
Cromaglass	28	86.7	56.8	29.6	29.1	28.6	27.8	28.6	29.1	29.6	38.0				29.3
Cromaglass	29	23.5	20.7	23.5	21.1	18.7	18.4	18.7	18.4	18.0	18.4	18.7			18.7
Cromaglass	30	103.3	64.6	25.9	29.6	25.9	29.6	33.4	32.2	31.0	32.2	33.4	32.2		32.2
Cromaglass	31	7.4	34.6	61.9	37.3	32.4	38.5	44.7	44.8	44.7	41.8				40.2
Cromaglass	32	78.3	63.0	50.6	49.1	47.7	34.5	25.3	23.3	21.3	23.3				41.1
Cromaglass	33	76.1	48.0	31.6	25.8	31.6	31.7	31.7	31.7	31.6					31.7
Cromaglass	34	49.5	114.9	49.5	47.8	49.5	51.6	53.8	61.0	68.3	74.1				52.7
Cromaglass	35	43.0	42.9	43.0	47.4	43.0	43.8	44.6	43.8	44.6	43.8				43.8
Cromaglass	36	100.1	90.1	80.1	78.9	77.8	78.9	77.8	63.7	77.8	76.3	74.8			77.8
Cromaglass	37	24.1	21.7	19.3	18.7	18.0	18.7	18.0	18.0	18.0	17.3	16.7			18.0
Cromaglass	38	61.3	49.0	36.8	35.1	33.4	24.5	15.7	16.0	16.3					33.4
Cromaglass	39	11.3	26.3	24.9	26.3	27.7	28.0	28.4	34.8	31.6	30.0	31.6			28.0
Cromaglass	40	17.2	13.5	17.2	18.9	17.2	18.9	17.2	15.5	17.2	17.9				17.2
Cromaglass	41	35.8	23.3	35.8	23.3	15.1	13.1	11.2	12.9	11.2	12.9				14.1
Cromaglass	42	48.2	29.2	10.2	11.6	10.2	11.6	13.1	11.6	10.2	11.6				11.6
Cromaglass	43	79.2	46.9	79.2	47.2	31.4	23.3	15.2	14.9	15.2					31.4
Cromaglass	44	8.3	11.5	14.6	14.6	14.6	14.6	14.5	12.6	10.6	9.8	9.1	9.9		12.0
Cromaglass	45	69.1	46.2	30.6	27.0	23.3	16.8	23.3	27.0	23.3	16.8	23.3			23.3
Cromaglass	46	29.1	24.0	29.1	29.7	29.1	29.7	30.3	31.8	33.4	38.4				29.7
Cromaglass	47	75.1	56.7	38.3	33.7	32.6	35.4	38.3	45.5	52.7	53.7				41.9
Cromaglass	48	30.1	48.0	65.9	48.0	52.7	59.3	52.7	54.6	56.5	60.6				53.7
Cromaglass	49	46.6	26.7	6.8	21.0	28.3	22.7	17.2	22.7						22.7
Cromaglass	50	18.0	22.0	18.0	21.1										19.5
Cromaglass	51	51.6	36.3	21.0	23.0	25.1	23.0	21.0							23.0
Cromaglass	52	18.1	16.6	18.1	29.0										18.1
Cromaglass	53	8.9	8.3	8.9	15.2										8.9
Cromaglass	54	21.2													21.2
Cromaglass	55	22.0	22.3												22.1
Cromaglass	56	21.5													21.5
Cromaglass	57	11.7	17.3	11.9	17.3										14.6
Cromaglass	58	7.1	16.6	26.1											16.6
Cromaglass	59	9.0													9.0
Cromaglass	60	41.5													41.5
Cromaglass	61	39.1													39.1
Cromaglass	62	18.4	18.1	18.4	18.3	18.4									18.4
Sample # Median		43.2	45.0	33.1	32.4	31.4	30.7	31.1	31.7	31.3	36.7	31.3	26.1		31.5
25th Percentile		21.6	24.0	19.6	21.1	23.5	22.8	18.9	18.5	18.0	18.3	19.0	16.3		19.3
75th Percentile		68.7	61.3	49.1	43.1	43.2	43.5	44.3	44.8	45.5	47.4	43.8	36.8		44.6
n		62	57	56	55	51	50	50	49	48	44	26	11		

Table 8. FAST running median of nitrogen (mg total L-1) by number of sampling events for each wastewater treatment system. The grand median, 25th percentile, 75th percentile, and number of systems sampled (N) per event are provided. (See Appendix 1 for discussion of data editing.)

Total Nitrogen Running Median		Number of Sampling Events																									Grand Median	
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
FAST	1	31.3	45.4	37.9	34.6	37.9	37.4	37.0	34.1	31.3	30.7	30.0	28.4	26.8	28.4	26.8	25.7	24.6	23.9	23.1	21.8	23.1	21.8	20.5	20.5	20.6		28.4
FAST	2	27.1	25.8	27.1	34.6	27.1	27.7	27.1	27.7	28.2	27.7	27.1	26.1	25.0	24.8	24.5	24.1	24.1	23.4	23.1	22.1	20.7	19.3	18.1	17.8	18.2	18.1	24.9
FAST	3	39.3	34.5	29.6	29.6	29.6	27.2	29.6	29.6	29.6	29.6	28.5	29.6	28.5	27.4	26.1	24.8	24.5	24.2	24.1	24.0	23.2	22.4	21.3			28.5	
FAST	4	32.4	23.0	23.9	25.1	23.9	18.9	15.9	15.5	15.9	15.5	15.0	15.5	15.9	17.5	15.9	15.5	15.0	14.4	13.8	13.7	13.8	13.7	13.6	13.5		15.5	
FAST	5	30.1	24.4	30.1	24.9	19.6	20.6	20.7	20.2	19.6	19.2	18.7	19.2	18.7	18.5	18.2	18.0	17.7	17.6	17.5	17.3	17.1	17.3	17.1			18.7	
FAST	6	12.4	16.6	20.7	21.4	20.8	21.4	22.0	22.3	22.0	22.2	22.4	22.5	22.4	22.2	22.0	21.4	20.8	20.8	20.8	20.8	20.7	20.3	19.8	18.0		21.1	
FAST	7	33.3	30.6	27.8	24.6	21.3	17.1	12.9	11.9	12.2	12.6	12.9	13.4	12.9	13.4	13.9	13.4	13.9	15.0	16.1	16.0	15.9	14.9				14.4	
FAST	8	48.6	40.7	32.7	29.5	29.8	31.0	29.8	29.4	29.8	31.0	32.2	31.0	29.8	29.4	28.9	27.6	26.2	26.2	26.1	20.9	15.6	15.5	15.4			29.5	
FAST	9	28.1	29.6	28.1	25.7	23.2	25.5	23.2	21.4	19.6	19.0	18.3	16.9	17.0	17.7	17.0	16.3	15.5	16.3	15.5	15.1	14.7					18.3	
FAST	10	16.5	17.1	17.6	24.7	17.6	17.1	17.6	17.1	16.5	16.5	16.5	16.5	16.5	16.5	16.5	17.1	16.5	16.5								16.5	
FAST	11	21.9	22.0	21.9	20.4	21.9	20.4	18.8	18.7	18.6	17.5	16.3	15.4	14.5	13.4	12.3	11.9	11.4										18.6
FAST	12	44.5	27.4	13.1	19.9	25.2	19.2	15.4	20.3	22.1	18.8	22.1	18.8	15.4	18.8	20.7												19.9
FAST	13	23.2	19.3	23.0	23.1	23.2	23.1	23.0	19.2	15.4	15.0	15.4	19.2	15.4	15.0	15.4												19.2
FAST	14	13.5	11.0	13.5	18.0	15.9	14.7	13.5	14.7	13.5	11.0	13.5	14.0	14.5	14.0	14.5												14.0
FAST	15	14.2	14.2	14.2	13.1	14.2	13.7	14.2	14.3	14.4	14.6	14.7	16.0	16.8	17.0	16.8												14.3
FAST	16	28.6	17.5	28.6	31.3	30.9	29.8	28.6	29.8	28.6	21.8	15.0	14.5															28.6
FAST	17	29.2	32.6	29.2	22.7	17.8	17.8	17.8	17.9	17.8	17.9	17.8	17.8	17.7														17.8
FAST	18	25.2	16.4	13.7	19.5	13.7	12.2	11.1	12.4	11.1	12.4	13.7	12.4															13.1
FAST	19	29.6	20.3	10.9	10.9	10.9	11.0	10.9	11.0	10.9	10.9	10.8	10.8	10.8	10.8													10.9
FAST	20	20.8	21.0	21.1	22.8	21.1	21.0	20.8	18.8	16.8	13.9	11.0	13.9															20.8
FAST	21	23.9	20.3	22.6	23.3	22.6	21.5	20.3	18.5	17.4	17.2	16.9	16.6															20.3
FAST	22	26.3	35.0	26.3	19.2	18.5	15.3	18.5	15.3	12.2	12.1	12.2	12.2															16.9
FAST	23	18.7	13.5	8.2	8.1	8.0	8.1	8.2	9.7	11.1	10.4	11.1	11.1															10.0
FAST	24	6.5	7.5	8.4	14.5	8.4	8.6	8.7	14.4	9.4	9.5	9.4	9.5															9.1
FAST	25	17.1	13.6	17.1	19.2	17.1	13.6	14.4	15.8	14.4	14.3	14.2	14.3															14.4
Sample#	Median	26.3	21.0	22.6	22.8	21.1	19.2	18.5	18.5	16.8	16.5	15.4	16.0	16.8	17.7	17.0	18.0	17.7	19.2	20.8	20.8	17.1	18.3	18.1	18.0	19.4	18.1	18.2
	25th Percentile	18.7	16.6	14.2	19.2	17.1	14.7	14.2	14.7	13.5	12.6	13.5	13.9	15.4	15.7	15.7	15.9	15.3	16.3	16.1	16.0	15.6	15.4	16.3	17.8	18.8	18.1	15.7
	75th Percentile	30.1	29.6	28.1	25.1	23.9	23.1	23.0	21.4	22.0	19.2	18.7	19.2	22.4	23.5	23.3	24.9	24.4	23.8	23.1	21.8	20.7	20.6	20.1	20.5	20.0	18.1	22.7
n	25	25	25	25	25	25	25	25	25	25	25	25	25	17	15	15	11	11	10	9	9	9	8	7	5	2	1	

Other Issues in 2020

Residential Pilot Program

The Commission is moving toward introducing new NSF Standard 245/USEPA ETV certified treatment technologies into the pilot program in late 2020 or early 2021. These third-party pre-screening programs evaluate technologies under controlled conditions for their ability to reduce total nitrogen to levels needed to meet Pinelands water quality standards when used on minimum one-acre parcels. This is an important first step. The equally important second step is provided by evaluating these technologies through the Commission's pilot program to monitor and evaluate the performance of these technologies under less-controlled, real world conditions.

Through this introduction of a third round of treatment technologies, the Commission remains committed to making the maximum number field verified technologies available to the residents on the Pinelands Area.

Ensuring that homeowners maintain their advanced wastewater treatment systems remains a priority in 2020. Periodic maintenance is not only critical to the effective removal of nitrogen, it is also important in extending the longevity of the treatment system and maintaining adequate hydraulic conductivity in receiving soils. It is for these reasons that both the Pinelands program and the latest NJDEP regulations require that operation and maintenance contracts remain in place throughout the life of each advanced treatment system.

As previously noted, on April 2, 2012, the NJDEP adopted amendments to N.J.A.C 7:9A, the statewide Standards for Individual Subsurface Sewage Disposal Systems. The amendments require perpetual professional management of advanced wastewater pretreatment components, including the Pinelands Alternate Design Wastewater Treatment Systems. Details of the DEP's rule adoption may be viewed on the DEP's web site at <http://www.nj.gov/dep/dwq/pdf/njac79a.pdf>.

In addition to the mandatory septic system management requirements that are contained in the Standards for Individual Subsurface Sewage Disposal Systems, additional septic system management requirements are contained in the New Jersey Water Quality Management Planning (WQMP) rules adopted by the NJDEP at N.J.A.C 7:15-4.5(c)1.vi.

The DEP's latest rules elevate the importance of maintaining operation and maintenance contracts in perpetuity by now declaring the absence of such a contract to be a violation of the New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.). Further, NJDEP's rules now define unmanaged advanced treatment systems to be in violation of N.J.A.C 7:9A-3.4. Each of the seven Pinelands Area county health departments is charged with enforcing both the Act and the Regulation.

Collectively, the NJDEP's rules provide the county health departments with a variety of administrative tools to ensure compliance with these requirements. N.J.A.C 7:9A-8.3(e) requires that administrative authorities (health departments) track and manage all advanced wastewater treatment systems with respect to the type and location of system, the date of system startup and the inspection and maintenance calls conducted on each system. The rule requires that this information be reported to the NJDEP annually. Further, while enforcement action is always taken as a last resort, provisions of the Water Pollution Control Act provide health departments with the ability to seek compliance with the requirement for operation and maintenance contract through the courts.

Commission staff was successful in working with the NJDEP to secure generic treatment works approvals (TWA) for the four new NSF Standard 245 advanced treatment systems that have been authorized to participate in the Commission's pilot program. The revised TWA authorizes local administrative authorities (generally County Health Departments) to approve the use of those advanced treatment technologies that are authorized for participation in the Commission's pilot program and requires that the systems be periodically serviced by qualified personnel. The Commission appreciates the cooperation it continues to receive from NJDEP in all aspects of administering the pilot program.

Non-Residential Activities

Access to advanced wastewater treatment technology can be crucial to the development of new and the expansion of existing commercial development in the Pinelands Area where regional sewerage service is not available. Notwithstanding the need for access to these treatment technologies by commercial uses, the Alternate Design Wastewater Treatment Systems Pilot Program was developed specifically to determine the capability of advanced treatment technologies to attenuate nitrogen in residential wastewater. This is due to the Pinelands Ad Hoc Septic System Committee's determination that insufficient data were available to establish specific nitrogen removal efficiencies in treating commercially generated wastewater due to the highly variable nature of non-residential wastewater (i.e. variable flow and constituent concentrations). While the CMP has long permitted non-residential development in unsewered Pinelands growth areas to propose to use advanced treatment technology (in lieu of dilution alone), no such uses were authorized prior to December 2007. With experience gained through the residential pilot program, the Commission has developed a process that has successfully led to four non-residential uses being approved. These systems have been installed in Pinelands Regional Growth Areas, Pinelands Towns and Pinelands Villages. Pursuant to a requisite legal agreement entered into between the commercial entity and the Commission, commercially used treatment systems are maintained by NJDEP licensed wastewater treatment system operators and effluent data is regularly submitted to the Commission to demonstrate that the systems are meeting Pinelands water quality standards. In addition to these existing systems, there are several other commercial development applications under review where advanced treatment will permit newly proposed development to meet Pinelands water quality standards.

Moreover, effective in March 2018, the CMP was amended to expand opportunities for certain preexisting nonresidential development to use advanced wastewater treatment to meet Pinelands groundwater quality standards. Through this amendment, applicants may propose to use advanced wastewater treatment to serve an otherwise conforming expansion or modification of a nonresidential use that existed on January 14, 1981 to another permitted use, provided the preexisting use relies upon an existing non-nitrogen reducing on-site wastewater disposal system and provided that such expansion or modification does not exceed 50 percent of the floor area, the area of the use or the capacity to the use permitted on January 14, 1981. Pinelands water quality will benefit from facilitating the use of advanced treatment systems by new permitted commercial development in Pinelands growth areas and by certain preexisting commercial development in the Pinelands Rural Development Area, Forest Area, Agricultural Production Area and Preservation Area District that are without public sewer service.

Cooperation with Local Government and Health Departments

The Commission continues to affirm its desire to assist the Pinelands Area municipalities in complying with the new NJDEP WQMP rules and the NJDEP Standards for Individual Subsurface Sewage Disposal Systems. These rules require all New Jersey municipalities to implement septic system management programs, for both traditional/conventional septic systems as well as advanced treatment technologies. Locally administered management programs help to ensure proper operation and maintenance of alternative treatment technologies as well as conventional or traditional septic systems. In the absence of septic system management programs, homeowners and businesses may neglect to perform the maintenance necessary to attain maximum longevity of their wastewater systems.

To advance the transfer of information acquired through the Pinelands alternate design treatment systems pilot program, Commission staff continues to share data with NJDEP and posts data from the annual reports on the Commission's web site.

Commission staff will continue to work with the local government officials, especially the Pinelands Area health officials and construction code officials, to achieve the objectives of the pilot program and to ensure that the required documentation is received prior to the issuance of construction approvals and certificates of occupancy. In addition, Commission staff will continue to work with the alternate design treatment systems technology vendors and their agents to ensure adherence to the requisite sampling, analysis and reporting requirements of the pilot program.

Questions related to the Pinelands Alternate Design Treatment Systems Pilot Program should be directed to Ed Wengrowski, Environmental Technologies Coordinator, at ed.wengrowski@pinelands.nj.gov or (609) 894-7300.