ANNUAL REPORT
TO THE NEW JERSEY PINELANDS COMMISSION

ALTERNATE DESIGN TREATMENT SYSTEMS PILOT PROGRAM

August 5, 2007

Background

The Federal and New Jersey Pinelands statutes 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 are protected and maintained through the control of 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) 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.

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 grand fathered 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 water quality standards of the CMP 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). The CMP utilizes the Pinelands Septic Dilution Model 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 2 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) is ineffective at removing or attenuating nitrogen levels in wastewater. Thus, unsewered residential development using standard (conventional) septic system technology is permitted only on minimum 3.2 acre parcels.

In order to comply with the Pinelands water quality standard, unsewered residential development on parcels smaller than 3.2 acres requires the use of advanced onsite denitrifying wastewater treatment technology. If the mass of nitrogen contained in the wastewater discharged from an on-site septic system is sufficiently reduced through the use of an advanced treatment system, the CMP allows the minimum lot size required to meet the 2 mg/l property line concentration to be reduced from 3.2 acres down to a minimum of 1.0 acre.

The basic principles of biological nitrogen reduction in wastewater are well documented in the engineering literature. In fact, biological nitrification and denitrification is now routinely employed at large centralized sewage treatment plants, especially those that discharge treated effluent to environmentally sensitive receiving waters. These large scale treatment facilities utilize professionally trained and licensed operators and have the ability to enhance nitrogen removal through the use of chemical feed equipment and to make real time process modifications in response to changing influent wastewater characteristics.

The use of biological denitrification technologies at the much smaller scale of individual onsite systems is a relatively recent development. The US EPA as well as number of 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 a consultant to assess the technical 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 extensive research, the Committee recommended the establishment of a pilot program to test five specific onsite wastewater treatment systems. The Alternative Design Wastewater Treatment Systems Pilot Program contained in

the CMP (N.J.A.C. 7:50-10.21) is authorized as a means to test whether these systems can be operated and maintained so as to meet the water quality standards contained in the CMP with maintenance requirements that a homeowner can be reasonably be expected to follow.

Significant dates pertaining to the pilot program are as follows:

August 5, 2002	Effective date of the pilot program; residential applications received after this date for lots less 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 may use a pressure dosing septic system, subject to additional time constraints.
January 10, 2003	Copies of sample ordinances authorizing the use of the advanced treatment technologies provided to Pinelands Area municipalities with correspondence requesting timely municipal adoption.
July 5, 2003	Start of semi-annual reporting requirement for each manufacturer of an alternate technology treatment system to submit to the Executive Director a report which includes the number of systems installed during the previous six months and since the beginning of the pilot program, a discussion of any installation problems and what has been done to address those problems, an analysis and evaluation of the monitoring results to date and a discussion of any operational or maintenance issues, including the number of systems requiring maintenance or repairs and the nature and success of such maintenance and repairs, and the number of times the automatic dialing alarm system was set off and the reasons for each such occurrence.
August 5, 2003	For completed applications received prior to August 5, 2002, last day to obtain design plan approval from a local/county health department for a pressure dosing septic system.
August 5, 2004	Last day to complete the installation of a pressure dosing septic system for those plans approved prior to August 5, 2003.
August 5, 2006	Executive Director to begin a review of the pilot program and report to the Commission by November 5, 2006 on the implementation of the program. The November 5 Implementation Report addressed nitrogen removal efficiencies of the treatment technologies, maintenance requirements, cost, frequency of system problems, 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 Acts.
November 5, 2006	Executive Director's Implementation Report issued to the Commission on the implementation of the pilot program. Recommendations included removal of the Ashco RSFIII system from the Alternate Design Treatment Systems Pilot Program due to its commercial unavailability, a temporary suspension of new Cromaglass installations based upon non-attainment of effluent total nitrogen targets and extension of the Alternate Design Treatment Systems Pilot Program to allow continued installation of the pilot program system through August 5, 2010 to provide an opportunity for additional system installations and the collection of additional effluent monitoring data.
May 21, 2007	Published proposed amendments to N.J.A.C. 7:50-10.21 - 10.23 in the New Jersey Register based upon recommendations contained in the November 2006 Implementation Report.
August 5, 2007	Under the original pilot program rule, effective August 5, 2002, last day to install a Pinelands alternate design wastewater treatment system. Systems installed on or prior to

	this date will be subject to the three year wastewater monitoring requirement, through August 5, 2010, and a five year warranty, and five year service contract, through August 5, 2012.
November 5, 2007	Anticipated effective date of CMP amendments extending the pilot program.
August 5, 2009	Executive Director to begin a second review of the pilot program and report to the Commission by November 5, 2009 on the implementation of the program based upon proposed amendments to N.J.A.C. 7:50-10.21 – 10.23, published on May 2, 2007.
November 5, 2009	Executive Director's second Implementation Report to be issued to the Commission on the implementation of the pilot program. The November 5, 2009 Implementation Report will address nitrogen removal efficiencies of the treatment technologies, maintenance requirements, cost, frequency of system problems, 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 Acts.
August 5, 2010	Last day to install a Pinelands alternate design wastewater treatment system, under November 2007 proposed CMP amendments, unless a rule is adopted which expressly authorizes such installations beyond this date. Systems installed on or prior to this date will be subject to the three year wastewater monitoring requirement, through August 5, 2013, and a five year warranty, and five year service contract, through August 5, 2015.

Introduction

Amendments to the CMP establishing the Pinelands Alternate Design Wastewater Treatment System Pilot Program became effective on August 5, 2002. The rule requires that the Executive Director submit an annual report to the Commission describing activity to date on the installation, maintenance and performance data for each alternate design wastewater treatment technology. This fourth annual report is submitted to fulfill the annual reporting requirement to the Commission on the status of the Pinelands Pilot Program for Alternate Design Wastewater Treatment Systems.

Before any of the five alternative technology systems could be used within the Pinelands, the manufacturer of the alternate design treatment system must have submitted and the Executive Director must have approved detailed engineering design plans and system specifications, details on the automatic alarm dialing system, a wastewater sampling protocol, an operation and maintenance manual, a sample five year warranty, a sample five year operation and maintenance contract, and a sample deed notice.

Use of the alternative onsite wastewater treatment systems are currently authorized only in those municipalities that have adopted an ordinance that provides for the use of such systems and where the ordinance has been certified by the Commission. (N.J.A.C. 7:50-10.22(a)1). While the majority of municipalities have adopted the required ordinance, several have not. This situation has created a hardship on land owners in those municipalities which have failed to adopt the requisite ordinance. The Commission has proposed amendments to the pilot program to address this which are discussed in detail below.

The CMP also requires that each technology manufacturer or its agent submit a semi-annual report to the Executive Director which includes 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

Under the August 5, 2002 Pilot Program rule, alternative systems are authorized for use only in those municipalities that have adopted an ordinance to implement the pilot program. Those ordinances must then be certified by the Commission pursuant to N.J.A.C. 7:50-3. To assist the municipalities in this process, pilot program ordinances were developed by the Commission's Land Use and Technology Office and provided to the 40 Pinelands municipalities in which alternative systems could be used based upon existing zoning. To date, implementing ordinances have been adopted, and the Commission has certified, ordinances in 34 municipalities.

Commission staff was faced with the challenge of resolving problems that have arisen as a result of the failure of six Pinelands Area municipalities to adopt ordinances to allow for the installation of the pilot program systems on otherwise conforming parcels. In these municipalities, the owners of unsewered parcels smaller than 3.2 acres could not develop those parcels, even as otherwise permitted by zoning and other land use requirements, due to the municipal governing body's failure to adopt the requisite ordinance. This resulted in considerable hardship to several landowners. In order to resolve this hardship, the Commission has proposed amendments to N.J.A.C. 7:50-10.21 to authorize the use of the pilot program systems in all Pinelands Area municipalities for the duration of the pilot program, whether or not the specific terms of the program are reflected in a municipal ordinance.

The following provides the status of municipal ordinance adoption as of August 5, 2007:

Status of Municipal Ordinances for Alternate Design Treatment System Pilot Program

Certified		*No Adopted Ordinance Yet*
Barnegat		Berkeley
Bass River	Waterford	Egg Harbor Township
Berlin Township	Weymouth	Little Egg Harbor
Buena Borough	Winslow	Plumsted
Buena Vista	Woodbine	Port Republic
Chesilhurst	Woodland	Southampton
Dennis		
Egg Harbor City		
Estell Manor		
Evesham		
Folsom		
Franklin		
Galloway		
Hamilton		
Hammonton		
Jackson		
Lacey		
Manchester		
Maurice River		
Medford		
Monroe		
Mullica		
Ocean		
Pemberton		
Shamong		
Stafford		
Tabernacle		
Upper		
Washington		

The NJDEP has actively participated in the development of the Commission's pilot program. To expedite the approval of the Pinelands pilot program alternate design septic systems, NJDEP issued a Generic Treatment Works Approval (TWA) Permit which allows the use of the five Pinelands pilot program systems without individual applicants being subject to the standard $450 NJDEP permit fee or 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 the applicants.

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 the review of plans and applications and to provide training of inspectors on the alternative treatment technologies. Staff remains available to coordinate additional training sessions on each of the alternative technology systems as requested. In June 2007, Commission staff played a key role in the National Environmental Health Association's annual conference in Atlantic City through its presentation on the Pinelands Pilot Program for Alternate Design Wastewater Treatment Systems, and through the Commission's septic system management consultant's presentation on the development of a Septic System Best Management Practice Manual for use by Pinelands Area municipalities. Commission staff also coordinated and lead a field trip to the Presidential Lakes area in Pemberton Township to provide approximately 30 participants with first-hand experience with the advanced onsite wastewater treatment technologies. In addition, Commission staff were invited to participate for the third straight year in NJDEP's annual Onsite Wastewater Treatment Seminar held at Rutgers EcoComplex to make a presentation on the Pinelands pilot program. This annual seminar is consistently well attended by engineers, builders, environmental commissioners and public health officials. Commission staff has routinely provided assistance to homeowners, builders, developers and consulting engineers in complying with the requirements of the pilot program.

The five Pinelands alternate design pilot program systems are:

1. Ashco RFS $^{III\ 1}$
2. Amphidrome
3. Bioclere
4. Cromaglass
5. FAST

One hundred-thirty (130) Pinelands alternate design treatment systems have been installed and activated to date, with the first system coming online in April 2004. Forty-five (45) of these alternate design systems were installed during the current reporting year, August 2006 through August 2007. The following table summarizes annual installations of each technology.

Technology	**Installed 2004**	**Installed 2005**	**Installed 2006**	**Installed 2007**	**Total Installed**
Amphidrome	7	10	11	29	57
Bioclere	-	2	11	9	22
Cromaglass	-	5	39	7	51
Total	7	17	61	45	130

In accordance with the provisions of the pilot program requirements, 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.

Ashco-A-Corporation provided the required documentation and based upon a detailed review by Commission staff,

[1] Amendments to the CMP, proposed on May 21, 2007 would remove 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.

the Executive Director approved the Ashco RFS ^{III} Gravity system effective May 15, 2003 and the Ashco RFS ^{III} Gravity Dosing system effective July 24, 2003. Based upon the Pinelands Septic Dilution Model, the pilot program provides that each Ashco RFS ^{III} system be located on a parcel containing at least 1.5 acres for each dwelling unit that will be served by the system.

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 system effective July 24, 2003. Based upon the Pinelands Septic Dilution Model, the pilot program provides that each Amphidrome system be located on a parcel containing at least one acre for each dwelling unit that will be served by the system.

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 system effective November 18, 2003. Based upon the Pinelands Septic Dilution Model, the pilot program provides that each Bioclere system be located on a parcel containing at least one acre for each dwelling unit that will be served by the system.

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 system effective December 29, 2004. Based upon the Pinelands Septic Dilution Model, the pilot program provides that each Cromaglass system be located on a parcel containing at least one acre for each dwelling unit that will be served by the system.

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 the Pinelands Septic Dilution Model, the pilot program provides that each FAST system be located on a parcel containing at least one acre for each dwelling unit that will be served by the system.

Installation Summary

The first Pinelands alternative wastewater treatment system was brought online in April 2004. Since then, a total of one hundred-thirty (130) Pinelands alternative wastewater treatment systems have been installed and are currently operational. Of these one hundred-thirty systems, fifty-seven (57) are Amphidrome systems, fifty-one (51) are Cromaglass systems, and twenty-two (22) are Bioclere systems. System type and location are summarized in the table below.

	Atlantic				**Burlington**				**Camden**		**Cape May**	**Gloucester**	**Ocean**				**Total**
System	Folsom	Hamilton	Mullica	Hammonton	Pemberton	Medford	Tabernacle	Woodland	Waterford	Winslow	Woodbine	Franklin	Jackson	Lacey	Manchester	Stafford	
Amphidrome	1	11	3	2	11	3	3		2	5		1	8	1	5	1	57
Bioclere		3	4		10		1	1		1	1		1				22
Cromaglass	1	4			22		1			4			11		8		51
TOTAL	**2**	**18**	**7**	**2**	**43**	**3**	**5**	**1**	**2**	**10**	**1**	**1**	**20**	**1**	**13**	**1**	**130**

There are no Ashco RFS ^{III} or FAST treatment systems installed in the Pinelands to date. Ashco-A Corporation, the

manufacturer of the Ashco RFS ^{III} technology has not made the necessary arrangements to market and support the use of the Ashco system in the Pinelands and, as a result, the Commission has proposed amendments to the CMP to remove that system from the pilot program. Bio-Microbics, the manufacturer of the FAST system, has finalized marketing and support arrangements and it is expected that the first FAST system will be installed in 2007.

System Permitting and Local Approvals

The pilot program relies upon the cooperation of local construction code officials, county health officials, alternate system manufacturers, 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 onsite treatment technologies. Prior to any Pinelands alternative treatment system being issued 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, deed notice, as-built plan and construction certification from the technology manufacturer and the NJ licensed engineer of record. While these documents have been received in the majority of cases, there have been instances of certificates of occupancy being issued prior to all required documentation being received by the health departments and the Pinelands Commission. In these cases, Pinelands staff has had to work with the technology vendors, homeowners and agency officials to obtain the needed documentation after the fact, often a difficult and time consuming task. Pinelands staff continues to work with the local agencies to educate them on the importance of assuring that all necessary documents are on file before issuing local approvals for home occupancy. This issue will need to be carefully evaluated and addressed in the forthcoming development of institutional arrangements for the long-term management of alternate wastewater treatment technologies in the Pinelands.

Maintenance Summary

The manufacturer of the Amphidrome system, F.R. Mahony Associates, identified a number of relatively minor problems during routine start-up inspections. Most common was the lack of a telephone line for use by the telephonic alarm system. In each instance, F.R. Mahony delayed issuance of their certification until the phone line connection could be confirmed. F.R. Mahony also reported a number of improperly installed control panels, pipe connections, wire connections, insufficient media and tank/bio-reactor leaks, all attributable to one installation contractor. F.R Mahony has taken steps to resolve these construction errors and has delayed issuing their construction certification until the installation errors were corrected.

F.R. Mahony Associates reported receiving auto alarm dialer notifications from one system and three telephone calls from homeowners to report system problems. In each of these instances, technicians were dispatched and repairs were made under warranty. In addition, several repairs were made as a result of observations made during routine service visits. In one instance, F.R. Mahony reports that it voided the warranty on a system blower after prolonged exposure of the unit to the weather, in violation of installation instructions. F.R. Mahony has recommended that the homeowner replace the blower and protect it from the elements, at which time the warranty would be reinstated. Lastly, F.R. Mahony reports one payment dispute that lead to court action. As a result of that action, one unit is without a service contract. The Commission's Regulatory Programs office is handling that matter as a CMP violation.

Cromaglass Corporation reported that there were no problems encountered during the installation of the Cromaglass systems during this reporting period. All Cromaglass systems are installed exclusively by Mid State Electric, Cromaglass' authorized mechanicals installation contractor. Cromaglass Corporation reported seven systems were repaired during the 2006-2007 reporting period. Several of the repairs were related to the improper disposal of cloth wipes into the system. Cromaglass also reported the replacement of three system "denite" valves and the routine pumping of solids from one system. All service was provided under Cromaglass' five-year warranty.

Aqua Point, the manufacturer of the Bioclere system reported that there were two alarm events requiring repair/maintenance action. Service agents were dispatched to reset a float switch and replace a pump in one unit.

The second unit was rendered operational after restart. During a routine service call, cosmetic damage resulting from a lawn mower deck was noted and repaired. All service and repairs were performed under the Bioclere 5 year warranty program.

Overall, maintenance requirements on each of the technologies has remained fairly stabile over the duration of the pilot program.

Cost Summary

An integral component of the pilot program is the monitoring by the Commission of treatment system costs. To facilitate the Commission's monitoring of these costs, the CMP requires the manufacturer of the treatment technologies to report on the cost of installation of each individual system.

It should be noted that the total cost of an onsite wastewater treatment system consists of at least three separate components, those being the cost of the alternative treatment unit and 5 year service package, the cost of the soil absorption system, and the cost of engineering and installation services. The manufacturers of the treatment unit can supply 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. The manufacturers, however, do not have direct knowledge of the cost of the soil absorption field installation, or the local engineering (soil testing, design services, as-built plans, etc.) of the system. This information is typically supplied by the home builder to the alternate system manufacturer who in turn supplies it to the Commission.

The following summary of alternate design treatment system costs is based upon information provided to the Commission by the system manufacturers, as supplemented by the local homebuilders. The reported cost of the treatment units, including the five year service package, has remained stabile over the duration of the pilot program. Minor changes in average costs, from year to year, are reflective of variability in non-treatment unit items such as the quantity of replacement soil and stone utilized in each system. For example, the cost of the Amphidrome, Bioclere and Cromaglass treatment units remained the same from 2006 to 2007 but the overall system cost, including engineering, soil absorption field materials, electrical connections, etc. actually decreased by an average of approximately $500 per system. The Commission continues to work with the NJDEP to identify ways in which overall system costs may be reduced. NJDEP has indicated that a reduction in the minimum required soil absorption field size has scientific merit due to the high quality effluent produced by these systems and that future revisions to the State's septic design standards may incorporate reduced field sizes. In addition, it is noteworthy that indirect cost savings may result from the use of these advanced treatment technologies. These savings may come as a result of avoiding or significantly delaying costs associated with the replacement of failed soil absorption fields. Because these types of systems typically remove up to 98 % of total suspended solids (TSS) and biochemical oxygen demand (BOD) , the likelihood of failure of absorption fields receiving such high quality effluent is greatly reduced.

Name of Treatment System Technology	**No. of Systems included in this cost analysis**	**Average Reported Cost per Treatment Unit and 5 year service package ***	**Average Reported Cost for Engineering, Soil Absorption Field Installation, Electrical Connections, etc. ****	**Average Reported Overall Cost of the Advanced Onsite Treatment Systems**
Amphidrome	35	$ 21,665	$ 9,646	$ 31,311
Bioclere	18	$ 16,750	$13,487	$ 30, 237
Cromaglass	39	$18,369	$15,047	$ 33,416

Table 1. Average Total Cost of Pinelands Alternate Design Wastewater Treatment Systems Note: Cost

information is derived from a variety of sources and should be considered to represent approximate cost estimates.

***** Cost of the Amphidrome Treatment Unit as sold by F.R. Mahony, Associates including hardware and equipment, 5 year annual maintenance contract, 5 year warranty, 3 years quarterly effluent analysis, pumping of 2000 gallon anoxic tank as necessary for 5 years, and delivery of equipment to job site is $ 14,750. In addition, the average cost of concrete tankage (2000 gal. concrete anoxic tank, concrete reactor vessel and 1000 gal. concrete clearwell), purchased separately from local suppliers, including delivery to the job site, is $ 6915. Tank cost varies depending on precast supplier and distance to shipping location.
* Cost of the Bioclere treatment unit as sold by Aqua Point, including hardware and equipment, 5 year annual maintenance contract, 5 year warranty, 3 years quarterly effluent analysis, pumping of 2000 gallon anoxic tank for 5 years, as needed, and delivery of equipment to job site is approximately $ 16,750.
* Cost of the Cromaglass treatment unit as sold by Cromaglass Corp., including hardware and equipment, 5 year annual maintenance contract, 5 year warranty, 3 years quarterly effluent analysis, pumping of anoxic tank for 5 years, as needed, and delivery of equipment to job site and electrical hookup of unit by Cromaglass mandatory mechanicals installer is approximately $22,345

****** Costs include determination of soil and site suitability (soil logs and "perc" tests), preparation of engineering plans, completion of NJDEP standard application forms, excavation for soil absorption system and tank placement, soil absorption system materials (suitable "K4" replacement soil, stone filter materials and lateral piping, or gravel free chambers, geotextile fabric), installation of all components, electrical connections, surveyor services, as-built plans, engineering construction observation and engineering certifications.

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 (3) years for a total of at least twelve (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 is to comply with the latest version of the NJDEP Field Sampling Procedures Manual, and analysis of effluent samples is to be performed by laboratories certified by the NJDEP employing analytical methodologies accepted by NJDEP. To permit the establishment of microbiological cultures necessary for the treatment process to develop and stabilize, no samples are required during the first ninety days from system start-up. In some instances, technology vendors have permitted the interval between sample collection to exceed the 90 day maximum and Commission staff continues to stress the importance of strict compliance with this and all other provisions of the pilot program rules. If it is determined that a manufacturer or its agent is not adhering to any of the requirements of the pilot program, N.J.A.C. 7:50-10.22(a)5 provides a mechanism for the Commission to make a determination that the proposed future use of a technology raises a substantial issue requiring a hearing pursuant to N.J.A.C. 7:50-4.31 through 4.42. In the event that persistent and substantial non-compliance with the requirements of the pilot program becomes problematic, Commission staff may recommend to the Commission that the substantial issue determination be made.

As discussed previously, there are a total of one hundred-thirty (130) Pinelands alternate design wastewater treatment systems installed and activated to date. Laboratory data for system performance are still limited at this time due in part to the number of systems that are operating, the relatively short duration of operation, the limited number of systems representing each specific technology, and the lag time between the initiation of the pilot program (February 5, 2002) and the date that the first alternative technology system was activated (April 2004).

As illustrated in Table 1 below, sample results have been submitted for forty-three (43) Amphidrome systems to date. One system has had twelve (12) analyses performed, four systems have had eleven (11) analyses performed, four systems have had ten (10) analyses performed, one system has had nine (9) analyses performed, one system has had eight (8) analyses performed, five systems have had seven (7) analyses performed, five systems have had six (6) analyses performed, four systems have had five (5) analyses performed, six systems have had four (4) analyses

performed, six systems have had three (3) analyses performed, and six systems have had two (2) analyses performed. A total of two hundred and fifty-two (252) samples have been collected from the forty-three Amphidrome systems.

As illustrated in Table 2 below, sample results have been submitted for seventeen (17) Bioclere systems to date. Two systems have had eight (8) analyses performed, two systems have had six (6) analyses performed, two systems have had five (5) analyses performed, six systems have had four (4) analyses performed, two systems have had three (3) analyses performed, one system has had two (2) analyses performed and two systems have had one (1) analysis performed. A total of seventy-two (72) samples have been collected from the seventeen (17) Bioclere systems.

As illustrated in Table 3 below, sample results have been submitted for forty-nine (49) Cromaglass systems to date. Two systems have had nine (9) analyses performed, five systems have had eight (8) analyses performed, eight systems have had seven (7) analyses performed, four systems have had six (6) analyses performed, nine systems have had five (5) analyses performed, fifteen systems have had four (4) analyses performed, three systems have had three (3) analyses performed, two systems have had two (2) analyses performed and one system has had one (1) analysis performed. A total of two hundred and fifty-seven (257) samples have been taken from the forty-nine (49) Cromaglass systems.

When evaluating data from single family wastewater treatment systems, it is important to recognize that home occupancy, water 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 certainly desirable, has the potential to result in higher concentrations of pollutants in the wastewater 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 40 mg/l, may under predict concentrations present in current domestic wastewater streams. It is important to note however, that the total mass of nitrogen excreted by individuals remains fixed at approximately 9 lbs. Thus while the concentration of total nitrogen may typically be greater than the assumed value of 40 mg/l, as evidenced in some reported effluent values, the total mass of nitrogen in the wastewater likely remains constant with dilution model assumptions. Even where effluent levels exceed assumed post treatment concentrations, system discharges may still be meeting total nitrogen loading targets.

The three certified treatment technologies that are currently operational in the Pinelands (Amphidrome, Bioclere, and Cromaglass) have an assumed nitrogen removal efficiency of 65%. 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 2 mg/l at the parcel line of a one acre lot based upon the Pinelands septic dilution model). Similarly, if influent nitrogen levels are 80 mg/l, the same 65% removal efficiency would result in effluent concentrations of 28 mg/l. It is noteworthy that the pilot program does not provide for the sampling and analysis of raw influent; therefore the percent removal efficiency of the alternate technology systems cannot be calculated at this time. Commission staff is working to develop a procedure to facilitate influent sampling to better characterize influent total nitrogen concentrations from current domestic sources.

Excessive use of certain cleaning 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 which provide critical information to the owners of the alternative treatment systems. In addition, several vendors have developed questionnaires which they've provided to system users which are aimed at identifying laundry and cleaning product usage and any other condition which might lead to non-compliant sample results. Staff will recommend that all of the technology vendors 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 1, 2 and 3 provide the grand median and running median total overall nitrogen concentrations (mg/l) by the number of samples taken for the Amphidrome, Bioclere and Cromaglass wastewater treatment systems respectively. The analysis indicates a grand median of 12.2 mg/l for the Amphidrome system and 12.2 mg/l for the Bioclere system. Both of these grand median concentrations are below the 14 mg/l target which is based upon the Pinelands septic dilution model. The grand median total nitrogen concentration for the Cromaglass system is 34.3 mg/l, significantly greater that the Commission's 14 mg/l target. These overall performance assessments are similar to the findings reported in the Commission's 2006 annual pilot program report. See appendix for a discussion of data limitations and editing methods.

Table 1. 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

		Number of Sampling Events												
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	System Median
Amphidrome	1	18.5	25.3	32.1	25.3	20.7	19.6	18.5	17.7	16.9	16.0	16.9		16.9
Amphidrome	2	18.1	13.3	9.4	10.4	10.3	10.0	9.8	9.6	9.4	9.4	9.4	9.6	9.6
Amphidrome	3	18.4	12.1	18.4	50.4	18.4	14.9	12.6	12.0	11.5	12.0			12.0
Amphidrome	4	35.3	29.2	23.2	16.4	9.7	8.4	7.8	7.5	7.2	7.5			7.5
Amphidrome	5	10.0	42.3	12.3	11.1	12.3	13.3	14.3	15.0	15.0	15.4			15.4
Amphidrome	6	6.0	33.8	6.9	9.8	12.7	14.8	12.7	11.1	9.5	11.1			11.1
Amphidrome	7	12.7	16.2	12.7	10.0	8.5	9.6	9.5	10.1	10.7	11.3	10.7		10.7
Amphidrome	8	15.2	15.4	15.2	12.1	9.1	9.5	9.1	9.0	8.9	9.0	8.9		8.9
Amphidrome	9	143.9	84.6	25.3	17.5	9.8	10.1	10.3	10.1	9.8	10.1	10.3		10.3
Amphidrome	10	5.8	4.9	5.8	6.6	7.0	6.7	7.0	7.1					7.1
Amphidrome	11	14.9	10.1	6.0	8.4	10.8	12.2							12.2
Amphidrome	12	18.8	27.6	36.4	33.6	36.4	38.3							38.3
Amphidrome	13	4.7	5.4	4.7	5.2	5.7	5.2	5.3	5.5	5.7				5.7
Amphidrome	14	24.5	17.2	9.8	9.7	9.5	9.4	9.4						9.4
Amphidrome	15	4.0	6.3	5.3	5.4	5.3	5.4	5.5						5.5
Amphidrome	16	11.7	16.7	11.7	11.4	11.2	11.4							11.4
Amphidrome	17	27.0	47.2	58.2	56.5	54.8	54.5							54.5
Amphidrome	18	11.1	12.9	11.1	10.3	9.4	10.3	11.1						11.1
Amphidrome	20	16.0	13.4	16.0	14.9	16.0	14.9							14.9
Amphidrome	21	7.5	8.1	8.8										8.8
Amphidrome	22	36.8	49.3	55.0										55.0
Amphidrome	23	25.4	16.2	11.0	10.3	11.0	11.3	11.6						11.6
Amphidrome	24	7.3	5.7	6.5	6.9	6.5								6.5
Amphidrome	25	11.6	13.5	15.3	15.7	15.9								15.9
Amphidrome	26	14.2	19.1											19.1
Amphidrome	29	7.6	17.6											17.6
Amphidrome	30	97.1	53.2	9.3	9.0	9.3	9.9	9.3						9.3
Amphidrome	31	11.8	13.5	12.3	12.9	13.5								13.5
Amphidrome	32	7.4	7.7	8.0	11.3									11.3
Amphidrome	33	6.4	5.0	6.4	6.0									6.0
Amphidrome	34	13.9	20.0	13.9										13.9
Amphidrome	35	9.0	11.5	13.9	16.0									16.0
Amphidrome	36	11.7	12.9	13.6	12.9									12.9
Amphidrome	37	9.9	9.5	9.9	10.8									10.8
Amphidrome	38	17.3	13.9											13.9
Amphidrome	41	27.4	26.7											26.7
Amphidrome	43	17.2	17.5	17.2										17.2
Amphidrome	44	11.9	13.6	15.3	15.9									15.9
Amphidrome	45	6.9	13.6	20.4	22.9	20.4								20.4
Amphidrome	46	9.0	9.7	10.4										10.4
Amphidrome	47	15.2	16.2	15.2										15.2
Amphidrome	48	37.6	28.3											28.3
Amphidrome	50	22.9	19.0											19.0
Sample # Median		13.9	15.4	12.3	11.3	10.8	10.3	9.6	10.1	9.7	11.1	10.3	9.6	**12.2**
25th percentile		9.0	11.8	9.3	9.8	9.3	9.5	8.7	8.2	9.0	9.4	9.4	9.6	**9.9**
75th percentile		18.6	22.6	16.0	16.0	15.9	14.8	11.8	11.6	11.3	12.0	10.7	9.6	**16.5**
N		43	43	37	31	25	21	16	11	10	9	5	1	**43**

Table 2. 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

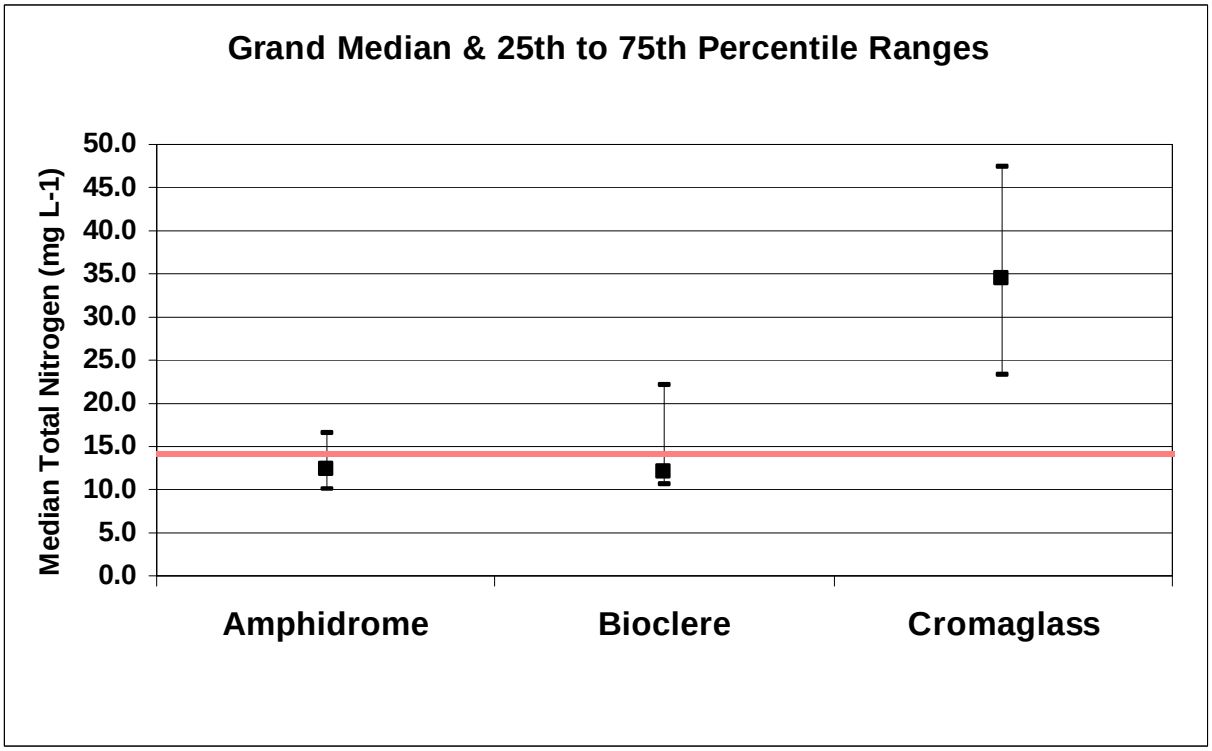
		Number of Sampling Events												
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	System Median
Bioclere	2	10.7												10.7
Bioclere	7	10.4	14.9	10.4	10.2	10.4	10.8							10.8
Bioclere	8	11.2												11.2
Bioclere	9	16.2	12.4											12.4
Bioclere	10	8.4	8.4	8.4	9.9	9.2	9.7	10.1	9.8					9.8
Bioclere	11	24.9	17.8	15.4	13.2									13.2
Bioclere	12	52.7	55.4	52.7	42.2	31.6	22.3							22.3
Bioclere	13	8.6	9.5	10.4	12.3									12.3
Bioclere	14	16.2	24.7	16.2	17.1	16.2	14.5	12.9	12.2					12.2
Bioclere	15	5.1	13.2	10.6	13.0	10.6								10.6
Bioclere	16	28.1	25.0	22.0										22.0
Bioclere	17	82.1	57.2	32.2	30.6									30.6
Bioclere	18	13.2	10.5	10.3	9.3	10.3								10.3
Bioclere	19	36.6	33.8	31.0										31.0
Bioclere	20	52.8	42.2	31.6	26.4									26.4
Bioclere	21	2.5	6.3	10.2	11.7									11.7
Bioclere	22	9.7	9.8	10.0	10.1									10.1
Sample # Median		13.2	14.9	13.0	12.6	10.5	12.7	11.5	11.0	-	-	-	-	**12.2**
25th percentile		9.7	10.1	10.3	10.2	10.3	10.5	10.8	10.4	-	-	-	-	**10.7**
75th percentile		28.1	29.4	28.8	19.4	14.8	16.5	12.2	11.6	-	-	-	-	**22.0**
N		17	15	14	12	6	4	2	2	-	-	-	-	**17**

Table 3. 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												
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	System Median
Cromaglass	1	140.1	78.6	17.1	32.2	26.3	36.9	43.6	41.0					41.0
Cromaglass	2	49.0	45.0	49.0	45.0	49.0	45.0	41.0	43.8	44.9				44.9
Cromaglass	3	76.5	58.2	50.4	45.2	50.4	47.6	50.4	55.9					55.9
Cromaglass	4	77.2	55.7	77.2	64.4	77.2	83.6	78.8	78.0					78.0
Cromaglass	5	110.6	99.0	87.4	71.8	56.2	45.7	35.1	30.3					30.3
Cromaglass	6	61.6	44.7	47.3	52.2	52.7	54.9	52.7	50.0					50.0
Cromaglass	7	67.5	52.3	37.1	50.1	63.1	52.8	53.0						53.0
Cromaglass	8	85.5	61.9	38.3	37.0	38.3	39.9							39.9
Cromaglass	9	19.7	39.7	19.7	19.6	19.7	19.6	19.5						19.5
Cromaglass	10	58.5	61.3	58.5	42.2	25.9	23.0	20.1	18.1	20.1				20.1
Cromaglass	11	35.1	47.2	35.1	34.3	35.1	34.3							34.3
Cromaglass	12	30.6	26.5	22.5	19.5	22.5	26.5	22.5						22.5
Cromaglass	13	17.4	10.8	12.4	14.9	17.4	16.0	14.6						14.6
Cromaglass	14	31.7	28.7	31.7	30.9	30.0								30.0
Cromaglass	15	18.0	64.0	32.1	38.3	32.1	30.1							30.1
Cromaglass	16	25.5	17.1	14.4	17.2	14.4								14.4
Cromaglass	17	43.4	56.7	43.4	32.4	43.4								43.4
Cromaglass	18	104.4	85.3	66.1	57.6	66.1	60.6	56.3						56.3
Cromaglass	19	67.5	71.7	67.5	42.8	67.5	62.8	58.1						58.1
Cromaglass	20	46.3	32.5	18.6	15.2	18.6								18.6
Cromaglass	21	45.9	64.2	45.9	38.4	30.9	21.8	14.7						14.7
Cromaglass	22	57.6	49.7	41.7	31.0	41.7	40.2							40.2
Cromaglass	23	37.4	73.3	37.4	32.7	28.1	32.7	37.4						37.4
Cromaglass	24	31.8	32.6	33.5	32.6	31.8								31.8
Cromaglass	25	52.8	42.8	32.8	35.0									35.0
Cromaglass	26	74.3	68.7	63.2	43.5									43.5
Cromaglass	27	90.3	148.3	90.3	87.8									87.8
Cromaglass	28	86.7	56.8	29.6	29.1									29.1
Cromaglass	29	23.5	20.7	23.5	21.1	18.7								18.7
Cromaglass	30	103.3	64.6	25.9	29.6	25.9								25.9
Cromaglass	31	7.4	34.6	61.9	37.3									37.3
Cromaglass	32	78.3	63.0	50.6	49.1									49.1
Cromaglass	33	76.1	48.0	31.6	25.8									25.8
Cromaglass	34	49.5	114.9	49.5	47.8									47.8
Cromaglass	35	43.0	42.9	43.0	47.4									47.4
Cromaglass	36	100.1	90.1	80.1	78.9									78.9
Cromaglass	37	24.1	21.7	19.3	18.7									18.7
Cromaglass	38	61.3	49.0											49.0
Cromaglass	39	11.3	26.3	24.9	26.3									26.3
Cromaglass	40	17.2	13.5	17.2	18.9									18.9
Cromaglass	41	35.8	23.3	35.8	23.3									23.3
Cromaglass	42	48.2	29.2	10.2	11.6									11.6
Cromaglass	43	79.2	46.9	79.2	47.2	31.4								31.4
Cromaglass	44	8.3	11.5	14.6	14.6	14.6								14.6
Cromaglass	45	69.1	46.2	30.6										30.6
Cromaglass	46	29.1	24.0											24.0
Cromaglass	47	75.1	56.7	38.3										38.3
Cromaglass	48	30.1	48.0	65.9										65.9
Cromaglass	49	46.6												46.6
Sample # Median		49.0	48.0	37.2	34.3	31.6	39.9	41.0	43.8	32.5	-	-	-	**34.3**
25th percentile		30.6	31.6	25.1	24.5	25.0	28.3	21.3	35.6	26.3	-	-	-	**23.3**
75th percentile		76.1	63.2	50.6	46.2	49.3	50.2	52.8	52.9	38.7	-	-	-	**47.4**
N		49	48	46	43	28	19	15	7	2	-	-	-	**49**

Figure 1. Box plots showing the 25th percentile, grand median, and 75th percentile of total nitrogen (mg L^{-1}) for each sampling event. Individual graphs are presented for each technology. The gray line at 14 mg L^{-1} represents the Pinelands Commission's target for the use of these systems on one acre lots. The number in parenthesis represents the number of systems included in the median value. (See Appendix 1 for discussion of data editing.)



Cromaglass Retrofits

As discussed earlier, in November 2006, the Commission instituted a temporary suspension on new Cromaglass systems pending satisfactory reductions in effluent total nitrogen concentrations. Cromaglass Corporation has responded by implementing a series of system retrofits characterized by the addition of fixed film media in select systems, reprogramming oxic/anoxic cycles of select systems, combined fixed film and reprogrammed cycles in select systems and combined fixed film, reprogrammed cycles and new floats and float levels in select systems. Cromaglass reports that thirty-five (35) systems have been retrofitted to date and that all systems are scheduled to be retrofitted. While the Cromaglass technology appears to have benefited from these retrofits, with the total nitrogen grand median improving from 42.5 mg/l in 2006 to 34.3 mg/l in 2007, the retrofits have not yet resulted in improvements to the degree necessary to lift the temporary suspension on new Cromaglass installations. Cromaglass continues to seek to identify and implement corrective measures through trials on one test unit in Williamsport, Pennsylvania and on another test unit at Penn State University, in Harrisburg, Pennsylvania. The suspension of new Cromaglass installations will remain in place until such time as Cromaglass Corporation demonstrates sustained nitrogen attenuation consistent with Pinelands water quality requirements.

Other Issues in 2007

One of the greater challenges to meeting the water quality standards of the CMP will be the development of a long-term program to address the continued approval, use and maintenance of advanced onsite treatment technologies. To achieve this goal, a long-term septic system management program must commence prior to the conclusion of this pilot program. Only through such a program can we ensure the long-term maintenance and monitoring of the alternative technologies. In the absence of a septic system management program, the ability to permit unsewered residential development on lots between one and three acres may be jeopardized. Absent a meaningful management program, rezoning of these parcels would likely be necessary. Moreover, the management of existing conventional systems, as currently required in the CMP, would also be addressed as would the development of a much needed septic system Best Management Practices Manual. To this end, the Commission has engaged Stone Environmental, Inc. to develop a Septic System Best Management Practices (BMP) Manual to assist local government entities in the establishment of institutional arrangements for the long term management of onsite wastewater treatment systems. Stone Environmental has conducted a series of meetings with septic system management technical advisory groups, has undertaken an analysis of the legal basis for local entities to require the management of septic systems and will be producing a number of draft BMP manuals for Commission review before undertaking a public outreach and education program in 2007 – 2008 to promote the local implementation of management programs.

Future Steps

The limited number of operating alternative treatment systems and the limited analyses upon which to evaluate these systems led the Commission to propose amendments to the CMP which would authorize the extension of the pilot program until August 5, 2010. If adopted at the Commission's August 10, 2007 meeting, these amendments would take effect on November 5, 2007.

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 assure 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 assure adherence to the requisite sampling, analysis and reporting requirements of the pilot program.

Further, in an effort to expand the number of treatment system choices available to Pinelands residential applicants, staff will continue to keep abreast of emerging small scale denitrification technologies and may return to the Commission in the future to recommend new rule making to allow the introduction of additional technologies to the pilot program. Several alternative systems are undergoing evaluation in other technology demonstration projects and preliminary results indicate that some of these systems, if used on appropriately sized lots, may also meet the water quality requirements of the CMP. A likely benefit to introducing additional proven technologies may be lower system costs resulting from increased competition among the approved technology vendors.

The existing pilot program is limited to residential development because the Pinelands Ad Hoc Septic System Committee determined that insufficient data were available to establish specific nitrogen removal efficiencies for the highly variable characteristics of non-residential (commercial and institutional) wastewater. The CMP allows non-residential applicants to propose to use an advanced treatment system (in lieu of dilution based upon parcel size) only on a case by case basis. Many Pinelands Towns and Villages could benefit from the use of pre-approved alternative treatment technologies by commercial establishments. Although the Commission staff remains ready to assist municipalities explore the use of "community" systems to serve multiple residential and commercial buildings, the Commission may wish at some future point to authorize pre-approved specific advanced treatment technologies for commercial uses as part of a closely monitored pilot program.

All advanced treatment systems require a higher level of maintenance to achieve optimum treatment efficiencies as compared to standard septic systems. Because of this, the CMP specifies that municipalities will be encouraged to allow community treatment systems to be installed in larger residential developments where lots between one and 3.2 acres are currently authorized. However, experience indicates that developers are frequently disinclined to propose a community treatment system because of delays in acquiring the necessary wastewater management plan amendments. Greater use of community treatment systems might be achieved if an expedited process for wastewater management plan amendments in the Pinelands could be developed. Moreover, Commission staff will work with the NJDEP to facilitate the approval of appropriate community wastewater treatment systems in unsewered Pinelands Regional Growth Areas, Towns and Villages.

Appendix 1

Data Editing

It should be noted that the retained data set includes instances where analyses for multiple parameters (from a single sampling event) were performed by different (DEP certified) laboratories under subcontract, i.e. nitrate and nitrite by one lab and total kjeldahl nitrogen by another lab, and where different (NJDEP approved) methodologies were used on various sampling dates from a single system location. In all of these instances, both the laboratories and analytical methods utilized were DEP approved and/or certified. Where laboratories reported analyte values as "Not Detected" the Commission's analysis assigned a concentration of one-half the laboratory reporting limit to that parameter when computing the total nitrogen mass in the sample.

Prior to conducting the data analysis, data were edited, sorted and evaluated by Commission staff. Where obvious errors in the data were evident, i.e. exceeding a maximum sample holding time or a lab reporting error, such data were discarded. When values for the various nitrogen parameters, (e.g. nitrate, nitrate, total kjeldahl nitrogen) were not collected during a single sampling event, the results of the individual parameters were not used in computing total nitrogen concentrations. After discarding such data and consulting with NJDEP's Office of Quality Assurance and Division of Water Quality, Bureau of Nonpoint Pollution Control, approximately 87 % of the submitted laboratory results were retained for analysis. This represents a significant improvement over data quality utilized in the Commissions November 2006 Implementation Report and is the result of Commission staff working with the technology vendors and laboratories to improve data quality.

Data Accuracy

It is typical for a regulatory pilot program of this nature to generate data that would not meet the rigorous standards required of a peer reviewed research project. Because of the uncontrolled variables associated with such a pilot program, the reader should understand that a pilot program of this nature is not research. Uncontrolled variables are significant and numerous where treatment technologies are operating under real world conditions. Apart from these real world pilot programs, a number of technology test centers (National Sanitation Foundation (NSF), US Environmental Protection Agency Environmental Technology Verification (ETV)) routinely conduct benchmark tests to determine what a treatment system is capable of doing. Such trials are conducted under rigidly controlled conditions. While these benchmark studies measure what a technology is capable of achieving, they do not assess what a technology actually achieves in widely ranging real world applications. Moreover, while standard assessment protocols are well developed for test center benchmark trials, there are currently no similar standard assessment protocols for evaluating actual field performance of treatment technologies. As recently as September 2006, the NSF's Joint Wastewater Committee formed a Field Performance Task Group to address this issue and the group hopes to develop a draft field performance protocol by September 2007. In December 1999, New Jersey, Massachusetts and Pennsylvania, acting under a Memorandum of Understanding (MOU) originally entered into in June 1996, agreed to work on the development of a standard protocol for approving innovative and alternate onsite wastewater treatment technologies. In its September 2005 report, released as a result of that MOU, this multi-state consortium acknowledged the dearth of third-party peer-reviewed, replicable data related to field trials of onsite wastewater systems. The group advises however, that even in the absence of "pure" data, regulators should exercise caution before throwing out "imperfect" data while

assessing onsite system performance. The consortium instead recommends that regulators rank data on the basis of a hierarchy of strength, and to not to allow the perfect to be the enemy of the good. The consortium produced a report for the New England Interstate Water Pollution Control Commission, entitled *Variability and Reliability of Test Center and Field Data: Definition of Proven Technology From a Regulatory Program Viewpoint.* In its report, the consortium concludes that all non-fraudulent field performance data on alternate design wastewater treatment systems is valuable in regulatory decision making, even if that data is not gathered in a completely controlled study.[1]

On April 16, 2007, the NJDEP, Division of Watershed Management, Bureau of Environmental Analysis and Restoration issued a technical report entitled Nitrate as a Surrogate of Assessing Impact of Development Using Individual Subsurface Sewage Disposal Systems on Ground Water Quality. In that report, NJDEP relied upon datasets from the USGS National Water Information System (NWIS) and the New Jersey Ambient Ground Water Quality Monitoring Network (AGWQMN) to establish an ambient nitrate concentration of 2 mg/L in NJ groundwater. In that analysis, DEP acknowledges retaining data with questionable precision, rather than abandoning data, to conduct its analysis.

The Pinelands pilot program involved multiple uncontrolled variables including homeowners, private laboratories, operation/maintenance companies, and wastewater technology vendors, all engaging in standard industry and marketplace practices. Some of these practices are regulated, such as laboratory certifications, while others are not. As a result of these real world conditions, it should be emphasized that the monitoring provisions of this pilot program do not rise to the level of peer-reviewed, journal-published research, but instead are intended to provide a statistically sound measure of the field performance of the pilot program systems. Variables that were not controlled in the pilot program include variability in the make up of households serviced by the systems, variability of wastewater flow and strength characteristics, variability in individuals involved in sample collection, variability in laboratories performing the analysis (including subcontracting between laboratories), and variability in laboratory personnel, equipment and analytical methods. Additionally, all samples were collected as grab samples (as opposed to composite samples) and are thus greatly affected by wastewater usage conditions which prevailed just prior to the sampling event and do not necessarily characterize long term effluent characteristics.

[1] Groves. T.W., F. Bowers, E. Corriveau, J. Higgens, J. Heltshe, and M. Hoover. 2005. Variability and Reliability of Test Center and Field Data: Definition of Proven Technology From a Regulatory Program Viewpoint. Project No. WU-HT-03-35. Prepared for the National Decentralized Water Resources Capacity Development Project, Washington University, St. Louis, MO, by the New England Interstate Water Pollution Control Commission