REPORT
TO THE NEW JERSEY PINELANDS COMMISSION

IMPLEMENTATION OF THE ALTERNATE DESIGN TREATMENT SYSTEMS PILOT PROGRAM

November 5, 2012

Background

The Pinelands Commission convened a special Ad Hoc Septic System Committee (Committee) in 2000 to research advanced septic system technologies that might better meet the water quality requirements of the Pinelands Comprehensive Management Plan (CMP) (N.J.A.C. 7:50-6, Part VII). The Committee's primary focus was directed toward identifying suitable treatment technologies to serve residential development on lots smaller than 3.2 acres, where such lots are authorized by N.J.A.C. 7:50-5. The Committee was comprised of seven Commission members, and one representative each from the Pinelands Municipal Council, Pinelands Preservation Alliance, and the New Jersey Builders Association. In its research efforts, the Committee consulted wastewater engineering professionals, state and regional on-site technology demonstration projects, alternate treatment system technology manufacturers, Pinelands Area county health departments, and other state and local agencies. Throughout the process, the Committee coordinated its research and program development efforts with the New Jersey Department of Environmental Protection (NJDEP).

Residential development using any of these systems must conform to the lot size and density requirements contained in the municipal land use ordinances that have been certified by the Commission pursuant to N.J.A.C. 7:50-3. Many municipalities have zoning which permits unsewered residential development on lots of less than 3.2 acres. Based upon its research, the Committee identified five technologies that it determined could be expected to meet Pinelands water quality requirements for residential development on these smaller lots. Based upon the Committee's recommendation, the Pinelands Commission approved the Amphidrome, Ashco RFS^{III}, Bioclere, Cromaglass, and FAST treatment system technologies to participate in the Pinelands Alternate Design Wastewater Treatment Systems Pilot Program. Based upon nitrogen removal expectations and the Pinelands Septic Dilution Model, the Committee concluded the Amphidrome, Bioclere, Cromaglass, and FAST systems could be permitted on lots of at least one acre and that the Ashco RFS ^{III} system could be allowed on residential lots of at least 1.5 acres.

The Amphidrome technology was the first of the pilot program systems to come online in 2004. The first Cromaglass systems came online in 2005. By 2006, Commission staff observed that the Cromaglass technology was not meeting effluent renovation expectations. In response, in November 2006, the Executive Director instituted a temporary suspension on new Cromaglass installations. The temporary Cromaglass suspension allowed individuals who has obtained a permit to construct a Cromaglass system or who had entered into a contract with an engineer to design a Cromaglass system were permitted to install the technology. The suspension on new installations remains in effect. Ongoing research and development efforts undertaken by the Cromaglass Corporation have recently resulted in significant improvements in the technology's ability to attenuate nitrogen levels in treated effluent. Based upon these preliminary findings, the Executive Director recommends that the Cromaglass technology be permitted to continue to participate in the pilot program until such time as prolonged performance enhancements are demonstrated. The temporary suspension on new Cromaglass installations will remain in place until such time as sustained treatment system performance is verified by laboratory testing.

During the period of August 2002 through December 2007, the manufacturer of the Ashco RSF ^{III} system did not demonstrate its ability or intention to participate in the pilot program or to make the technology commercially available in the Pinelands Area. As a result, in December

2007, the CMP was amended to remove the Ashco RFS^{III} technology from the pilot program.

In October 2010, the CMP was further amended to authorize additional, pre-screened technologies to participate in the pilot program. The October 2010 amendment authorizes the participation of select NSF Standard 245 and/or USEPA ETV certified nitrogen reducing wastewater treatment technologies. The Executive Director recommended and the Commission approved the Septi-Tech, Bio-Barrier, Busse GT and Hoot ANR treatment systems for participation in the Commission's pilot program. NJDEP is currently finalizing a generic treatment works approval that will authorize Pinelands Area Health Departments to approve the four newly authorized treatment systems. Each of the NSF Standard 245 and/or USEPA ETV certified technologies will be permitted on lots of at least one acre, based upon the Pinelands Septic Dilution Model.

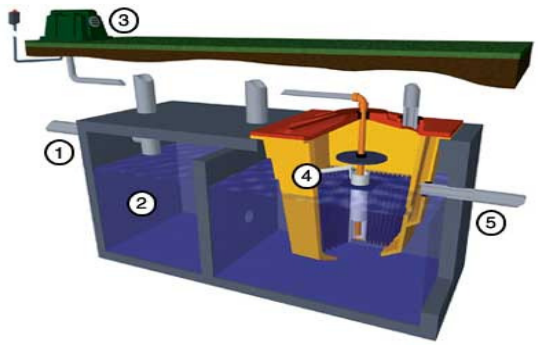
Pilot Program Implementation Reporting

The CMP requires periodic assessment and reporting on the status of the pilot program. This report, dated November 5, 2012 is the third in a series of such implementation reports. Previous implementation reports were dated November 5, 2006 and November 5, 2009. Currently, N.J.A.C 7:50-10.23(c) directs that this implementation report focus on the FAST and Cromaglass treatment technologies. A comprehensive assessment of all of the pilot program technologies is available in the Commission's annual report, dated August 5, 2012, available at http://www.state.nj.us/pinelands/landuse/waste/2012_Annual_Septic_Pilot_Program_Report.pdf.

N.J.A.C. 7:50-10.23(c)1 through 6 specifies that the FAST and Cromaglass technologies be evaluated in accordance with the flowing criteria:

1. The level of nitrogen in the effluent from each treatment technology (Note: 14 mg/l TN in treated effluent is required to meet Pinelands water quality standards on a one acre residential parcel);
2. The maintenance required for each technology to meet effluent requirements;
3. The cost of installing and maintaining each treatment technology;
4. The problems associated with the installation, operation and maintenance of each treatment technology;
5. The number of systems of each technology that have been authorized under the pilot program; and
6. Whether the pilot program, when viewed in its entirety, has served to further the purposes and objectives of the Pinelands Protection Act, the Federal Act and this Plan.

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 prevent a dying-off of the system, making the system well suited to intermittent use applications.

As illustrated in Table 1, sample results have been evaluated for eighteen (18) FAST systems to date. One (1) system had at least sixteen (16) analyses evaluated, four (4) systems had at least fourteen(14) analyses evaluated, five (5) systems had at least thirteen (13) analyses evaluated, seven (7) systems had at least twelve (12) analyses evaluated, eight (8) systems had at least eleven (11) analyses evaluated, nine (9) systems had at least ten (10) analyses evaluated, nine (9) systems had at least nine (9) analyses evaluated, nine (9) systems had at least eight (8) analyses evaluated, eleven (11) systems had at least seven (7) analyses evaluated, eleven (11) systems has at least six (6) analyses evaluated, fourteen (14) systems has at least five (5) analyses evaluated, fourteen (14) systems has at least four (4) analyses evaluated, sixteen (16) systems has at least three (3) analyses evaluated, sixteen (16) systems has at least two (2) analyses evaluated and eighteen (18) systems had at least one (1) analysis evaluated. A total of one hundred and fifty-two (152) samples have been used to evaluate these eighteen (18) FAST systems. Total reported nitrogen values for each of these FAST systems represents the sum of reported laboratory values of reported laboratory values for total kjeldahl nitrogen plus total nitrite and nitrate nitrogen.

The FAST technology has produced a grand median total nitrogen concentration of 23.7 based upon all samples to date, showing some improvement over the grand median concentration of 26.5 mg/l as reported by the Commission is August 2011, but not meeting the target concentration of 14 mg/l TN.

FAST Retrofits

Bio-Microbics evaluated each of its operating FAST systems seeking to identify the cause for inadequate attenuation (inability to meet 14 mg/l TN in final effluent). This work resulted in the discovery of a number of units with airlift and/or recycle trough deficiencies. Retrofits were made to correct the deficiencies to existing units and modifications were made during the installation of new units. Subsequent to the correction of these problems, sample results from post-retrofit systems were analyzed. The results of this analysis indicate significant improvement in system performance. The results of the post retrofit system samples are provided in Table 2. The grand median TN value of 15.9 mg/l from this analysis, while not fully meeting the Commission standard of 14 mg/l, represents a significant improvement over pre-retrofit sampling results. Staff continues to monitor the effectiveness of FAST system retrofits.

The CMP currently authorizes the FAST technology to be installed until August 5, 2013. **Based upon improved treatment system performance resulting from system retrofits, the Executive Director recommends that the FAST system's participation in the pilot program be extended and that FAST systems be authorized for installation until August 5, 2016.**

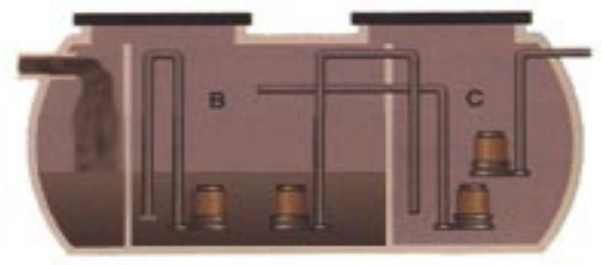
Table 1. FAST running median of total nitrogen (mg L-1) by number of sampling events for each wastewater treatment system. The grand median, 25th percentile, 75th percentile, and number of systems sampled (N) per event are provided. (See Appendix 1 for discussion of data editing.)

		Number of Sampling Events																	
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Grand Median	Percentile
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			32.7	
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	27.1	
FAST	3	39.3	34.5	29.6	29.6	29.6	27.2	29.6	29.6	29.6	29.6	29.6	28.5	29.6	28.5			29.6	
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			16.7	
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				20.2	
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					21.7	
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					15.3	
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	
FAST	9	28.1	29.6	28.1	25.7	23.2	25.5	23.2	21.4	19.6	19.0							24.3	
FAST	10	16.5	17.1	17.6	24.7	17.6	17.1	17.6										17.6	
FAST	11	21.9	22.0	21.9	20.4	21.9	20.4	18.8										21.9	
FAST	12	44.5	27.4	13.1	19.9	25.2												25.2	
FAST	13	23.2	19.3	23.0	23.1	23.2												23.1	
FAST	14	13.5	11.0	13.5	18.0	15.9												13.5	
FAST	15	14.2	14.2	14.2														14.2	
FAST	16	28.6																28.6	
FAST	17	29.2	32.6	29.2														28.6	
FAST	18	25.2																25.2	
Sample# Median		28.6	25.1	25.5	24.8	23.2	21.4	22.0	22.3	22.0	22.2	24.8	22.5	25.0	26.6	24.5	24.1	**23.7**	
25th Percentile		21.9	18.7	19.9	21.8	20.9	19.6	18.2	20.2	19.6	19.0	17.8	17.3	18.7	22.9	24.5	24.1		18.2
75th Percentile		32.4	31.1	29.3	28.5	26.6	27.4	28.4	29.4	29.6	29.6	29.7	27.2	26.8	28.4	24.5	24.1		28.2
n	18	18	16	16	14	14	11	11	9	9	9	8	7	5	4	1	1		

Table 2. FAST post retrofit TN (mgL-1) sample results. The grand median, 25th percentile, 75 percentile, and number of systems sampled (n) are provided. (See appendix 1 for discussion of data editing.)

		Number of Sampling Events													
Technology	System	1	2	3	4	5	6	7	8	9	10	11	12	Grand Median	Percentile
FAST	1	37.5												37.5	
FAST	2	12.0	13.0	14.0	16.0	17.9								14.0	
FAST	3	27.4	25.8	27.4	25.8									26.6	
FAST	4	9.2	12.6	14.9	15.4	14.9	17.8	14.9	17.3	15.9				14.9	
FAST	5	11.7	16.6	20.7	19.5	18.2	17.7	17.5	17.5	17.5				17.5	
FAST	7	8.2	18.0	21.3	15.1	12.8	10.8	8.8	8.8	8.8	10.5	12.2	12.5	11.5	
FAST	9	19.6	16.9	14.2	14.9									15.9	
FAST	10	16.4	17.0	17.6	24.7	17.6	17.0	17.6	17.0					17.3	
FAST	11	16.3	15.4											15.9	
FAST	12	10.2	11.7	13.1	13.1	13.1								13.1	
FAST	13	23.3	19.4	23.0	23.2	23.3								23.2	
FAST	14	13.6	11.1	13.6	18.0	15.9								13.6	
FAST	15	11.9												11.9	
FAST	17	29.2	32.6	29.2										11.9	
FAST	18	25.2												25.2	
Sample No. Median		16.3	16.8	17.6	17.0	16.8	17.3	16.2	17.2	15.9	10.5	12.2	12.5	**15.9**	
25th Percentile		11.8	12.9	14.1	15.1	14.5	15.5	13.4	15.0	12.4	10.5	12.2	12.5		12.3
75th Percentile		24.3	18.3	22.2	22.2	18.0	17.7	17.5	17.4	16.7	10.5	12.2	12.5		19.3
n		15	12	11	10	8	4	4	4	3	1	1	1		

Cromaglass Technology



The Cromaglass system is a SBR (Sequencing Batch Reactor) 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 bio-mass (sludge) in a separate aeration and quiescent settling chamber within a single vessel. Cromaglass systems are capable of achieving 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. Such information can indicate if service or maintenance is needed.

As illustrated in Table 3, sample results have been evaluated for sixty-two (62) Cromaglass systems through July 5, 2010. No new data has been analyzed since that date due to Cromaglass' failure to comply with the sampling and reporting requirements of the pilot program. Eleven (11) systems had at least twelve (12) analyses evaluated, twenty-six (26) systems had at least eleven (11) analyses evaluated, forty-four (44) systems had at least ten (10) analyses evaluated, forty-eight (48) systems had at least nine (9) analyses evaluated, forty-nine (49) systems had at least eight (8) analyses evaluated, fifty (50) systems had at least seven (7) analyses evaluated, fifty (50) systems had at least six (6) analyses evaluated, fifty-one (51) systems had at least five (5) analyses evaluated, fifty-five (55) systems had at least four (4) analyses evaluated, fifty-six (56) systems had at least three (3) analyses evaluated, fifty-seven (57) systems had at least two (2) analyses evaluated and sixty-two (62) systems had at least one (1) analysis evaluated. A total of five hundred and fifty-nine (559) samples have been used to evaluate these sixty-two (62) Cromaglass systems. 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 has produced a grand median total nitrogen concentration of 31.5 mg/l, failing to meet the Commission's 14.0 TN standard for unsewered residential development on a minimum one acre parcel

Cromaglass Retrofits

As discussed above, the Commission instituted a temporary suspension on new Cromaglass systems in November 2006, pending satisfactory reductions in effluent total nitrogen concentrations. Cromaglass Corporation initially responded by implementing a series of system retrofits characterized by the addition of fixed film media to the otherwise suspended growth technology, reprogramming aerobic/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. The impact of these initial retrofits was minor at best and the TN grand median value of 31.5 mg/l confirmed that Cromaglass technology, as initially retrofitted, was unable to meet the Pinelands pilot program standard of 14 mg/l TN. The temporary suspension on new Cromaglass installations remains in effect.

In an ongoing attempt to improve system performance, Cromaglass Corporation undertook a research and development (R&D) effort at the Kelly Township (PA) Municipal Utility Authority Wastewater Treatment Plant during the period of February 2010 through November 2010. The R&D effort identified fourteen engineering and operational problems that are reported to have directly or indirectly affected the Cromaglass units participating in the Pinelands pilot program. Each of these fourteen deficiencies were addressed in the Kelly Township program leading to total nitrogen effluent levels that met the Pinelands standard of 14 mg/.l. In September 2011, Cromaglass requested that the Commission permit the firm to implement these retrofits throughout the Pinelands. The Commission authorized the retrofits to be performed on one-half (28) of the existing Pinelands systems, provided that Cromaglass continue to provide operation and maintenance services on all Pinelands Cromaglass units at no additional cost to homeowners. Further, the retrofits and laboratory analyses are to be performed at no additional cost to the homeowners, and that retrofits be performed on the worst performing units to the maximum extent possible. Retrofits on the first 28 systems were completed prior to a May 1, 2012 deadline. The first round of post-retrofit sampling was completed on May 2, 2012. The results of the first round of post retrofit system samples are provided in Table 4. The grand median TN value of 18.0 mg/l from this initial sampling round, while not fully meeting the Commission standard of 14 mg/l, represents a significant improvement over pre-retrofit sampling results. Pending sustained treatment level improvements, the Commission anticipates the remaining 28 systems will also undergo identical retrofitting.

The CMP currently authorizes the Cromaglass technology to be installed only until August 5, 2013. **Based upon improved treatment system performance resulting from system retrofits, the Executive Director recommends that the Cromaglass' participation in the pilot program be extended until August 5, 2016. This continued participation would allow for further evaluation of the system and an ongoing assessment of the system retrofits. During this period, the Executive Director could lift the temporary suspension on new Cromaglass installations if sustained improvement in treatment system efficiencies is observed.**

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	Grand Median
Cromaglass	1	142.1	76.6	117.1	32.2	25.3	36.9	43.6	41.0	38.5	38.5	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	76.8	58.2	50.4	45.2	50.4	47.6	50.4	55.9	50.4	47.6	44.9		50.4
Cromaglass	4	77.2	55.7	77.2	64.4	77.2	63.6	78.8	78.0	77.2	69.1	61.0		77.2
Cromaglass	5	110.6	99.0	67.4	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	37.5	38.3	39.9	45.7	41.1	45.7	41.1			45.7
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	16.634	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	28.5	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	28.8	28.6			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	28.5	41.1	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	47.6	43.5	52.9	62.3	66.2			43.5
Cromaglass	18	104.4	65.8	66.1	57.6	66.1	60.6	66.8	65.7	65.2	52.1	49.0	40.9	66.9
Cromaglass	19	67.5	71.7	67.5	42.8	67.5	62.8	58.1	39.6	21.1	39.6	31.1	28.1	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	33.4	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	28.5	19.5	24.8	19.2	30.9
Cromaglass	25	52.8	42.8	32.8	35.0	37.5	42.6	47.9	55.5	52.8	55.1			45.5
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			56.5
Cromaglass	28	56.7	56.8	29.6	29.1	28.6	27.8	28.6	29.1	29.6	36.0			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	71.4	34.6	61.9	37.3	32.4	38.5	44.7	44.8	44.7	41.8			42.2
Cromaglass	32	78.3	63.0	50.6	49.1	47.7	34.5	28.3	23.3	21.3	23.3			41.1
Cromaglass	33	76.1	46.0	31.6	28.8	31.6	31.7	31.7	31.7	31.6				31.7
Cromaglass	34	49.5	112.9	49.5	47.8	49.5	51.6	53.8	61.0	68.3	74.1			52.7
Cromaglass	35	43.2	42.9	43.2	47.4	43.2	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	11.8	26.8	24.9	26.8	27.7	28.0	28.4	34.8	31.6	30.0	31.6		28.0
Cromaglass	40	17.2	13.5	17.2	16.9	17.2	16.9	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	45.2	29.2	13.2	11.6	13.2	11.6	13.1	11.6	13.2	11.6			11.6
Cromaglass	43	79.2	46.9	79.2	47.2	37.4	23.3	15.2	14.9	15.2				37.4
Cromaglass	44	8.3	11.5	14.6	14.6	14.6	14.6	14.5	12.6	10.6	9.6	9.1	9.9	12.0
Cromaglass	45	69.1	46.2	30.6	27.0	23.3	18.8	23.3	27.0	23.3	18.8	23.3		23.3
Cromaglass	46	29.1	24.0	29.1	29.7	29.1	29.7	30.3	31.8	33.4	36.4			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	46.0	65.9	46.0	52.7	59.3	52.7	54.6	56.5	60.6			53.7
Cromaglass	49	46.6	28.7	8.8	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	29.2									18.1
Cromaglass	53	8.9	8.3	8.9	18.2									8.9
Cromaglass	54	21.2												21.2
Cromaglass	55	22.5	22.5											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	9.5												9.5
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	28.1	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	45.2	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	28	11	

Table 4. Cromaglass post retrofit TN (mgL-1) sample results. The grand median , 25th percentile, 75 percentile, and number of systems sampled (n) are provided. (See appendix 1 for data editing)

System ID	Technology	Sample Date	Total N	
3	Cromaglass	5/1/12	9.2	
5	Cromaglass	5/1/12	10.1	
6	Cromaglass	5/1/12	36.0	
7	Cromaglass	5/1/12	77.0	
8	Cromaglass	5/1/12	11.3	
11	Cromaglass	5/1/12	7.5	
13	Cromaglass	5/1/12	72.1	
16	Cromaglass	5/2/12	21.8	
17	Cromaglass	5/1/12	16.5	
19	Cromaglass	5/2/12	8.3	
20	Cromaglass	5/2/12	74.5	
21	Cromaglass	5/2/12	10.7	
22	Cromaglass	5/2/12	30.7	
23	Cromaglass	5/2/12	14.4	
25	Cromaglass	5/2/12	76.3	
26	Cromaglass	5/2/12	11.6	
28	Cromaglass	5/1/12	28.3	
30	Cromaglass	4/30/12	19.1	
31	Cromaglass	5/1/12	10.8	
36	Cromaglass	5/2/12	5.1	
38	Cromaglass	5/1/12	42.3	
39	Cromaglass	4/30/12	20.3	
41	Cromaglass	5/1/12	16.5	
43	Cromaglass	5/2/12	22.1	
46	Cromaglass	5/1/12	31.6	
47	Cromaglass	5/1/12	16.1	
48	Cromaglass	5/1/12	16.9	
49	Cromaglass	5/1/12	34.2	
	Median Value		18.0	
25th Percentile				11.2
75th Percentile				32.2
n				28

Evaluation

1. **The level of nitrogen in the effluent in each alternate design pilot program treatment system technology based on an evaluation of all monitoring results for that technology under this pilot program.**

The CMP requires that the manufacturer of each technology provide for the collection and analysis of effluent samples on a quarterly basis for the first three years that each system is in use (for a total of twelve samples per system). All samples must be analyzed by laboratories certified by the NJDEP. In addition, approved monitoring protocols require that sample procurement be in conformance with the latest NJDEP Field Sampling Procedures Manual (Manual). The Manual specifies quality assurance procedures in the collection and transport of samples, i.e. chain of custody, sample preservation, etc. All laboratory analytical procedures must be approved by NJDEP's Office of Quality Assurance. Effluent samples are collected from a sample collection port located between the treatment unit and the soil dispersal field. To permit the establishment of biological cultures necessary for the treatment process to develop and stabilize, no sampling is required during the initial ninety days from system start-up.

Post retrofit data for both the FAST and Cromaglass technologies indicate that each of these systems has the potential to achieve significant reductions in total nitrogen in domestic wastewater effluent. Continued participation of both the FAST and Cromaglass technologies is recommended, provided sustained improvement in treatment system efficiency is achieved and the participating vendors abide by all pilot program requirements.

2. **The maintenance required for each alternate design pilot program treatment system technology to meet the required nitrogen targets.**

The pilot program is structured to effectively identify and correct problems encountered during system startup by requiring system manufacturers or agents to be onsite during system startups. Automatic alarm dialers have met the intended purpose of promptly alerting operation and maintenance personnel to operational problems. The comprehensive five year warranty protections of the pilot program have prevented homeowners from incurring costs associated with service calls during this period. The FAST and Cromaglass technology manufacturers have taken steps to proactively address mechanical operational problems as evidenced by the implementation of retrofit programs that have resulted in performance improvements to date.

3. **The cost of installing and maintaining each alternate design pilot program treatment system technology.**

Installation costs are reported to the Commission at the time of system start-up. The total cost of an onsite wastewater treatment system consists of at least three separate components including: the cost of the alternative treatment unit (with 5 year service package), the cost of the soil absorption system, and the cost of engineering and other installation services. The manufacturer of the treatment unit provides equipment costs and support service costs to the Commission. Other costs, such as engineering and construction are typically supplied by the homeowner or builder to the system manufacturer who in turn provide it to the Commission.

The following cost summary is based upon information provided to the Commission by the system manufacturers, as supplemented by the local homeowner or builder. The reported cost of

the treatment units, including the five year service package, has remained relatively stable over the duration of the pilot program.

Recent (April 2012) changes to the NJDEP septic system design standards (N.J.A.C 7:9A allow for a reduction in the minimum soil absorption field size where higher quality effluent is produced by alternative treatment units, including those that participate in the Commission's pilot program. These recent regulatory changes are expected to reduce overall construction costs. In addition, because these systems typically remove up to 98 % of total suspended solids (TSS) and biochemical oxygen demand (BOD) the frequency of soil absorption field repair or replacement should be greatly reduced.

Summary of cost data as of August 2012

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**
Cromaglass	41	$22,345	$12,920	$ 35,265
FAST	12	$17,957	$12,122	$ 30,079

Table 1A. 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.

* Includes reported cost of the Cromaglass treatment unit (through July 2010) as sold by Cromaglass Corp., including hardware and equipment, 5 year annual maintenance contract, 5 year warranty, 3 years quarterly effluent analysis, pumping of residuals for 5 years, as needed, and delivery of equipment to job site and electrical hookup of unit by authorized Cromaglass installer. There were no Cromaglass units installed in the current reporting year.
* Includes reported cost of the FAST treatment unit (through May 2012) as sold by Bio-Microbics, including hardware and equipment, 5 year annual maintenance contract, 5 year warranty, 3 years quarterly effluent analysis, pumping of residuals for 5 years, as needed, and delivery of equipment to job site.
**** 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.

The total cost of each of the alternate design treatment technologies is approximately twice that of the average cost of a pressure dosing septic system. Purchase of a pressure dosing system would not, however include a five year of operation and maintenance contract, 5 year warranty, and quarterly effluent sampling, nor would the pressure dosing system provide enhanced treatment of wastewater . The total cost of the alternate design treatment technologies may be as much as two to three times the cost of a conventional septic tank-leach field system. However, such systems (both pressure dosing and conventional) may only be used to serve development on a 3.2 acre or lager parcel, whereas the alternate design technologies may be used on minimum one acre parcels.

The advantages of improved water quality, professional system maintenance and the ability to meet water quality standards in areas currently zoned for one-acre residential development supports the continued participation of the FAST and Cromaglass systems in the pilot program.

4. The problems associated with the installation, operation and maintenance of each

alternate design pilot program treatment system technology and the frequency with which each such problem occurs, the measures taken to eliminate any such problem and the success of those measures.

The CMP requires each technology manufacturer to report to the Commission on the frequency and nature of system startup and operational problems.

FAST
Bio-Microbics, the manufacturer of the FAST treatment technology has designated Site Specific Design, Inc. (SSD) to act as their authorized agent overseeing all sales and installation in the Pinelands. SSD has provided installation training and support during the installation on the FAST treatment systems. This level on-site support has been successful in avoiding installation problems. The automatic alarm dialer system which alerts service personnel of a system error has proven to be a reliable means to identify and remedy operational errors. Few such errors have been experienced with the FAST system to date.

Cromaglass
Cromaglass systems were installed exclusively by Mid-State Electric (MSE), Cromaglass' then authorized system installer. By using MSE as its only installer, Cromaglass Corporation attempted to maintain tight control over the installation of the technology. This arrangement was intended to minimize installation errors attributable to inexperienced installers. Unfortunately, Cromaglass Corporation reports that there were a number of installation and operation issues that Cromaglass has attributed to MSE. In response, Cromaglass has now assumed the direct role of installation and servicing agent, better insuring proper maintenance of existing Cromaglass units.

With improved performance of both the FAST and Cromaglass technologies, coupled with improvements to the installation and servicing of these systems, the continued participation of these technologies in the pilot program is warranted.

5. The number of systems of each technology that have been authorized under the pilot program.

The first Pinelands alternate design pilot program treatment system was brought online in April 2004. From April 2004 through August 2012, a total of fifty six (56) Cromaglass and eighteen (18) FAST systems have been installed, bringing the combined total of Cromaglass and FAST systems to seventy-four (74). A total of 220 pilot program systems were installed during this period. The following table summarizes Cromaglass and Fast installations by year of installation.

Technology	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total Installed
Cromaglass	-	5	39	7	4	1	0	-	-	56
FAST	-	-	-	-	2	5	3	5	3	18
Total	0	5	39	7	6	6	3	5	3	74

The total number of Cromaglass installations coupled with the total number of systems samples

is generally adequate to provide a reliable assessment of system performance. Additional sampling of the retrofitted Cromaglass systems is desirable to better assess if sustainable improvement in system performance is to be achieved.

The total number of FAST installations, while still relatively small, has produced more than 152 individual sample results. The number of post-retrofit samples results is still relatively small. Additional sampling of the retrofitted FAST systems is desirable to better assess if sustainable improvement in system performance is to be achieved.

6. Whether the pilot program, when viewed in its entirety, has served to further the purposes and objectives of the Pinelands Protection Act, the Federal Act and this Plan.

The pilot program has facilitated the installation of more than 220 alternate design treatment systems, representing four advanced onsite treatment technologies during the period of August 2002 through August 2012. The pilot program has demonstrated that advanced treatment technologies are currently available for residential use, which, with proper operation and maintenance, can achieve substantial compliance with the purposes and objectives of the Pinelands Protection Act, the Federal Act and the CMP. The addition of four new NSF Standard 245/ USEPA ETV systems will further the Commission's ability to determine each technology's ability to meet the purposes and objectives of the State and Federal Act as well as the CMP.

Conclusions and Recommendations

The Pilot Program provides a means to test whether select onsite wastewater technologies can be maintained and operated to meet the water quality standards of the CMP in a manner that a homeowner can be reasonably expected to follow. The pilot program has been successful in identifying two advanced treatment technologies (Amphidrome and Bioclere) that can be fully expected to achieve compliance with Pinelands water quality standards when used at appropriate densities established through the Pinelands septic dilution model and land use zoning requirements. The continued use of onsite advanced treatment technologies is essential to the efficient use and orderly development of designated growth areas of the Pinelands. The pilot program has also demonstrated that the successful cooperation between municipal, county, NJDEP and Pinelands staff has resulted in the development and implementation of administrative procedures essential to the management of the pilot program technologies.

The pilot program uses a combination of regulatory requirements and market based incentives to achieve a desired outcome with respect to treatment system efficiency, durability and cost. It has always been an objective of the pilot program to make suitable advanced treatment system technology available to Pinelands Area residents at the lowest possible cost. Moving forward, staff believes that increasing competition between system manufactures and service providers is likely to have the greatest effect on controlling and perhaps reducing overall costs for advanced technology use.

The CMP currently authorizes the installation of the Cromaglass and FAST treatment technologies only until August 5, 2013. The Bio-Barrier, Busse GT, Hoot ANR and SeptiTech technologies that were recently added to the pilot program are authorized to be installed until August 5, 2016. The Executive Director recommends that the Commission amend the CMP to permit continued installations of the Cromaglass and Fast technologies until August 5, 2016, to coincide with the authorization date applicable to the four new technologies. This suggested CMP amendment would provide Commission staff the opportunity to review effluent monitoring data from Cromaglass and FAST installations that have benefitted from the retrofit program discussed above.

The CMP specifies that the Executive Director may repeal the pilot program as it pertains to one or more technologies if it is determined that the pilot program has not been implemented or has not been successful for one or more of the treatment system technologies. The CMP also provides that upon said repeal, any subsequent local approval for a development that is proposing to use a repealed technology be determined to raise a substantial issue with CMP water quality standards through the Commission's call up process. As noted previously in this report, the Executive Director has instituted a temporary suspension on the use of new Cromaglass installations. Staff is hopeful that system retrofits and sustained performance improvements will result in the eventual lifting of the new installation suspension.

Commission staff is drafting CMP amendments to authorize the continued installation of the FAST and Cromaglass technologies until August 5, 2016. Draft amendments will be provided to the Commission's CMP Policy and Implementation Committee for consideration in early 2013.

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 (certified) laboratories under subcontract, i.e. nitrate and nitrate 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.