COMMONWEALTH of VIRGINIA

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December 12, 2013

TO: District Health Directors and Environmental Health Managers

THROUGH: Cynthia Romero, MD, FAAFP
State Health Commissioner

THROUGH: Allen Knapp, Director
Office of Environmental Health Services

FROM: Dwayne Roadcap, Director
Division of Onsite Sewage, Water Services, Environmental Engineering and Marina Programs

SUBJECT: GUIDANCE MEMORANDUM AND POLICY 156

Purpose: 12VAC5.613-90.D of the *Alternative Onsite Sewage System Regulations* (12VAC 5-613, the *AOSS Regulations*) took effect on December 7, 2013. Section 90.D applies to alternative onsite sewage systems (AOSS) located in the Chesapeake Bay watershed for which (1) a construction permit application is submitted on or after December 7, 2013, or (2) an application for reissuance of a renewable operating permit is submitted on or after December 7, 2013. This section of the regulation does not apply to conventional onsite wastewater treatment systems. This guidance implements the Board of Health's regulations for nitrogen (N) from onsite wastewater treatment systems in the Chesapeake Bay Watershed. This policy will be reviewed no less than annually and more frequently as needed to update technical information.

Scope: This policy applies to AOSS with flows less than or equal to 1,000 gallons per day (also known as small AOSS) that are installed within the Chesapeake Bay Watershed. Direct dispersal systems are not covered by this policy (see 12VAC 5-613-90.D.4). Large AOSS rely on sampling to verify compliance with the total nitrogen (TN) limits so the Best Management Practices (BMPs) discussed in this policy do not apply to large AOSS (systems with flows greater than 1,000 gallons per day). See Appendix C for more information about large AOSS designs.

Background: See Appendix B for a picture of the Chesapeake Bay Watershed. One can determine whether an AOSS is located within the Chesapeake Bay watershed at: http://dswcapps.dcr.virginia.gov/htdocs/maps/huexplorer.htm.

Small AOSSs must reduce TN by 50 percent from the level produced by a conventional onsite sewage system. The AOSS Regulations use a BMP concept to facilitate compliance with the TN reduction requirements for small AOSSs. A BMP is a conservation or pollution control practice approved by the division through this policy, such as wastewater treatment units or shallow effluent dispersal fields. A BMP also manages nutrient losses or other potential pollutant sources to minimize pollution of water resources.

BMPs listed in this policy are conservative designs that are presumed to comply with the 50 percent TN reduction. No additional monitoring is required. Compliance with the BMP is verified through reports submitted by the system operator. Reports are submitted at least annually for small AOSS.

The US Environmental Protection Agency (EPA) convened an Onsite Wastewater Treatment System Expert Panel (hereafter the Panel) in January 2012 to identify BMPs that would be accepted to facilitate the Commonwealth's progress in meeting nutrient reduction to the Chesapeake Bay. The Panel includes representatives from the Chesapeake Bay watershed states, academia, and EPA. The Panel was tasked with identifying and recommending onsite wastewater treatment technologies or modifications to existing technologies that would reduce nitrogen loads to the Chesapeake Bay Watershed. The Panel reviewed relevant research and various design guidelines for potential BMPs. The discussion of BMPs was limited to small AOSS.

The Panel produced a draft report in August 2013 entitled "Recommendations of the On-Site Wastewater Treatment Systems Nitrogen Reduction Technology Expert Review Panel – Final Report." Multiple BMPs are proposed within this report and additional BMPs will be considered by the panel in the future. VDH is using the Panel's report to implement 12VAC5-613-90D.1. The latest version of the report can be found at http://www.chesapeakebay.net/calendar/event/19152.

Calculating Percent Reductions for BMPs:

Any BMP for TN reduction must be compared to the baseline assumptions for conventional onsite sewage systems in the EPA's Chesapeake Bay Model. The EPA's model for nutrient reduction uses a baseline of 9 lb TN/person/year at the edge of the drainfield or 4 kg/person/yr. The TN reduction credit for a given BMP is for any reduction of TN that reduces the 4 kg/person/year at the edge of the drainfield. Therefore, if a BMP provides a 50 percent reduction, then the TN load at the edge of drainfield is 2 kg TN/person/yr (or 4.5 lb/person/yr).

The influent TN load may be assumed or measured to calculate the load reduction for a given BMP, or combination of BMPs. Influent load is assumed to be 5 kg/person/yr. No TN reduction credit is provided for effluent passing through a septic tank. There is some TN removal from wastewater passing through a septic tank, but the amount removed is negligible and is assumed to be zero. See the Panel report for additional explanation.

The baseline system is considered to be a septic tank and gravity drainfield, which produces an edge-of-drainfield TN load of 4 kg/person/yr or 9 lb/person/yr. Given an assumed influent of 5 kg TN, and a baseline reduction of 20 percent (as effluent passes through a gravity drainfield), then the result is 4 kg TN at the edge of a conventional gravity drainfield. BMPs are given credit for TN reduction beyond the baseline condition of 4/kg/person/year (9 lb/person/yr).

BMPs fall into one of three general groups:

1. Ex situ, or treatment systems, which are components that are not associated with the natural soil environment;
2. In situ, or soil treatment systems, which are components that are associated with the natural soil environment; and
3. Combinations of ex situ and in situ processes.

Ex situ treatment systems reduce TN prior to application to the soil. Table 1 lists the recognized ex situ BMPs and the associated ***gross*** TN reduction. In situ treatment systems utilize the soil matrix to reduce TN. Table 2 lists the recognized in situ BMPs and the associated ***gross*** TN reduction. Table 3 provides the ***net*** TN reduction for the ex situ and in situ combinations. Each BMP has specific design criteria. A design that does not follow the specific criteria listed in this policy is not a recognized BMP. Designs that do not utilize recognized BMPs may be submitted under 12 VAC 5-613-90.1.b when properly documented and monitored. See Appendix D for use of non-generally approved technologies that are not considered a recognized BMP.

Each BMP has an assumed TN reduction percentage assigned to it. For example, a single pass sandfilter or NSF 40 treatment unit provides a TN removal of 20 percent. A shallow placed drip system provides a 50 percent reduction. **The AOSS must be evaluated as a complete system (accounting for both ex situ and in situ reduction) to determine the TN reduction.** Three example calculations are provided below to help explain the concept.

Example #1: An AOSS using a NSF 40 treatment unit or single pass sandfilter, followed by a shallow drip installation:

Step 1: Identify the reduction from additional treatment.

> 5 kg TN (assumed influent) → NSF 40 treatment unit (or single pass sandfilter) reduces the TN by 20 percent, so the TN delivered to the drip field equals 4 kg TN.

Step 2: Identify the reduction from the dispersal field.

> 4 kg TN (delivered to drip field) → the shallow drip field reduces TN by 50 percent so the TN at edge of drainfield → 2 kg TN.

Step 3: Calculate the system net TN reduction

> TN reduction equals 50 percent [((4-2)/4) x 100 = 50 percent]. This AOSS would comply with the 50 percent reduction.

Example # 2: A second example clarifies why the TN reduction requires a two-step evaluation to confirm the 50 percent reduction. In this example, assume an AOSS consists of a septic tank with a shallow placed drip system with 12 inches of cover.

Step 1: Identify the reduction from additional treatment.

> 5 kg TN → Septic Tank, the Septic Tank reduces the TN by 0 percent. TN delivered to drip field → 5 kg TN

Step 2: Identify the reduction from the dispersal field.

> 5 kg TN delivered to drip field → shallow drip reduces TN by 50 percent. Thus, TN at edge of drip field equals 2.5 kg TN.

Step 3: Calculate the system net TN reduction

> The TN (net) reduction equals 38 percent [((4-2.5)/4) x 100 = 38 percent]. This AOSS would ***not*** meet the 50 percent reduction. The combination of the treatment unit and the dispersal field establishes the TN (net) reduction.

Example #3: This example addresses the use of a proprietary treatment device that is approved for the 50 percent reduction with a gravity drainfield.

Step 1: Identify the reduction from additional treatment.

> 5 kg TN → approved 50 percent TN removal from the treatment unit. TN delivered to drip field → 2.5 kg TN

Step 2: Identify the reduction from the dispersal field.

> 2.5 kg TN delivered to the gravity drainfield → This dispersal reduces TN by 20 percent. Thus, TN at edge of drip field equals 2 kg TN.

Step 3: Calculate the system net TN reduction

> The TN (net) reduction equals 50 percent [((4-2)/4) x 100 = 50 percent]. This AOSS would meet the 50 percent reduction. The combination of the treatment unit and the dispersal field establishes the TN (net) reduction.

Table 1
Gross TN Reduction
Ex situ Treatment Systems

Treatment BMP	Gross TN Reduction
1. Generally Approved TL-2 or TL-3 Treatment Unit	20%
2. Subsurface-Constructed Wetland	20%
3. Single Pass Sand Filter	20%
4. Re-circulating Sand or Gravel Filter	50%
5. Approved Proprietary N Removal Treatment Unit	50%

Table 2
Gross TN Reduction
In situ (Soil Based) Systems

Soil Based BMP	Gross TN Reduction
6. Shallow Placed, Pressure Dosed Soil Dispersal (drip dispersal or low pressure distribution (LPD)	50%
7. Elevated Sand Mound	50%
8. Gravity drainfield (any depth) or pressure distribution drainfield that is deeper than 12-inches from the ground surface.	20%

Table 3
Treatment and Soil Based BMP Combinations
Net TN Reduction

Treatment Unit Gross TN Reduction	Soil Dispersal Gross TN Reduction	Net TN Reduction of Combined System
• Septic Tank (0 %)	• Gravity drainfield (20%)	0%
• Septic Tank (0 %)	• Shallow placed drip or LPD (50%) • Elevated Sand Mounds (50%)	38%
• Single Pass Sand filter (20%) • Constructed Wetlands (20%) • TL-2 or TL-3 Treatment Unit (20%)	• Gravity drainfield (20%)	20%
• Single Pass Sand filter (20%) • Constructed Wetlands (20%) • TL-2 or TL-3 Treatment Unit (20%)	• Shallow placed drip or LPD (50%) • Elevated Sand Mounds (50%)	**50%**
• Recirculating Sandor Gravel Filter (50%) • Proprietary N Removal Systems (50%)	• Gravity drainfield (20%)	**50%**
• Recirculating Sandor Gravel Filter (50%) • Proprietary N Removal Systems (50%)	• Shallow placed drip or LPD (50%) • Elevated Sand Mounds (50%)	**69%**

BMP #1: Generally Approved TL-2 or TL-3 Treatment Unit (20 percent)

Generally approved TL-2 or TL-3 units under the AOSS Regulations are assumed to reduce TN by a gross 20 percent. There are two mechanisms by which units may receive the TL-2 general approval. First, NSF 40 Class I treatment units are generally approved for TL-2. NSF 40 Class I certified units are listed at http://www.nsf.org/Certified/Wastewater/Listings.asp?TradeName=&Standard=040. Next, NSF 40 Class I certified units may be certified through other test sites, such as the Gulf Coast Testing Center, or otherwise evaluated and listed as a result, see http://www.vdh.virginia.gov/EnvironmentalHealth/ONSITE/documents/2010/pdfs/approved%20secondary%20devices.pdf. Generally approved TL-3 units are listed as 'Evaluation Completed' under GMP 147 at http://www.vdh.virginia.gov/EnvironmentalHealth/ONSITE/gmp/evaluationcompleted.htm

BMP #2: Subsurface-Constructed Wetlands/Vegetated Submerged Beds (20 Percent)

This BMP is limited to wetlands with a submerged water surface so that public health concerns over vector attraction and human contact are reduced. Subsurface-constructed wetlands are also known as Vegetated Submerged Beds or VSBs. VSBs receive effluent from a primary settling tank (septic tank) and treat the wastewater through a gravel media that has wetland plants growing in the media.

This BMP requires the following design components:

- (Preceded by) a properly sized and designed septic tank.
- Media size and specifications:
  - 40 to 80 mm effective size (ES) gravel in inlet distribution and outlet collection zones. All gravel media shall have a hardness of three or more and be washed clean of fines and debris, unless the division grants an exception.
  - 20 to 30 mm ES in treatment zone
  - 6-inches top layer of planting media (e.g., peat, soil, expanded slate) for planting natural species. Wire mesh netting (e.g., chicken wire) can be installed underneath this layer and in the berms to deter burrowing animals.
  - Media depth $\leq$ 2 feet of stone at least 0.1 m above the water level
- Length $\geq$ 50-feet.
- Surface area $\geq$ 54 ft^2/person (assume two persons per bedroom).
- Organic Loading Rate (OLR) $\leq$ 1.2 lb BOD5/1000 ft^2/day.
- Ability to vary flooding depth using outlet structure. Outlets are generally simple rotating 90-degree elbows that can be adjusted as needed.
- Installation within a watertight tank or in the ground with 30 mil liner.
- The bed surface shall be level, and the bottom shall slope slightly to enable drainage, unless the division grants an exception to this policy.

BMP #3: Single Pass Sand Filter (20 Percent)

Single pass sand filters consist of a septic tank, a dosing tank, and the sand filter. This BMP is limited to dosed systems and not gravity fed sand filters. Settled wastewater from the septic tank flows to the dosing tank where a pump or siphon time doses the sand filter. The sand filter treats wastewater by a series of physical and biological processes. Nitrogen losses are minor and are attributed to ammonia volatilization and denitrification. Minimum design and installation criteria for intermittent media filters (IMFs) include:

- (Preceded by) a properly sized/designed septic tank, with a minimum 48-hour hydraulic retention time (HRT).
- Properly sized pump tank (≥ 1.5 x HRT) with timer-based flow equalization controls to dose 12 to 24 times/day.
- Media (sand) size and specifications:
    - ES = 0.5 – 1 mm
    - Media uniformity coefficient (UC) ≤ 4.0
    - X ≤ 0.5 percent fines passing #200 sieve
- Media depth = 2 ft or more.
- Hydraulic loading rate (HLR) ≤ 2 gpd/ft^2.
- OLR ≤ 5 lb BOD/1000 ft^2/day
- Uniform, pressurized distribution with a spacing that provides 4 to 6 ft^2 per orifice (i.e., 2' × 2' or 2' × 3' grid).
- Installation within watertight tank or in the ground with 30 mil liner.

This system design may not be generally approved for BOD_5 and TSS removal; so sampling may be required to verify compliance with BOD_5 effluent limits.

BMP #4: Re-circulating Sand or Gravel Filter (50 Percent):

Re-circulating sand or gravel filters are comprised of a septic tank, a recirculation tank, and the media filter. Flow is pumped from the recirculation tank to the media filter where BOD reduction occurs and the wastewater is nitrified. When the nitrified wastewater is returned to the recirculation tank, the influent carbon, low dissolved oxygen, and high nitrate levels promote denitrification. The wastewater is re-circulated through the media filter three to five times to maximize the nitrification and denitrification process. Minimum design and installation criteria for re-circulating sand/gravel filters include:

- (Preceded by) a properly sized/designed septic tank, with a minimum 48-hour hydraulic retention time.
- Properly sized recirculation pump tank (≥ 1.5 x HRT) with timer-based flow equalization controls to dose 24 to 48 times/day.
- Media size and specifications:
    - For sand media:
    - ES = 1-5mm
    - UC ≤ 2.5

    - HLR ≤ 5 gpd/sf
    - OLR ≤ 5 lb BOD/1000 sf-day
    - ≤ 0.5 percent fines passing #200 sieve
- For gravel media:
    - ES = 5 to 20 mm
    - UC ≤ 2.5
    - HLR ≤ 15 gpd/ft^2
    - OLR ≤ 15 lb BOD/1000 ft^2/day
    - ≤ 0.5 percent fines passing #200 sieve
- Media depth = 2 feet or more.
- Uniform, pressurized distribution with a spacing that provides 4 to 6 ft^2 per orifice (i.e., 2' × 2' or 2' × 3' grid).
- Re-circulation device capable of re-circulating three to five times the forward flow back to separate anoxic recirculation tank or second compartment of septic tank.
- Installation within watertight tank.

The re-circulation rate is between three and five times the forward design flow to optimize denitrification. Periodic saturation and draining of the filter media is important for drawing air into the system for effective nitrification. Filters are generally dosed under pressure every 30 minutes to an hour. This BMP does not extend to other media types. This system may not be generally approved for BOD_5 and TSS removal; so sampling may be necessary to verify the required effluent limits.

BMP #5: Generally Approved Proprietary TN Reducing Treatment Unit (50%)

Proprietary treatment units are developed, marketed, and constructed by a manufacturer and have standardized design and construction criteria. The manufacturer typically has ongoing responsibilities for maintaining designs, developing installation procedures, and training operators. These treatment units will go through a two step process to comply with this BMP. Step one will involve a third party certification for TN reduction, along with an O&M manual, plans and specifications, and engineering certification. The second step involves field testing. The process is similar to the process described by GMP 147 for TL-3 general approval.

Manufacturers initially listed under this BMP are found in Appendix A. The initial listing will remain in effect until June 7, 2014. The initial list of manufacturers in Appendix A includes treatment units that have completed and passed NSF 245 testing and units that have been approved through Maryland's Department of the Environment for 50 percent N reduction. The division will also consider data sets that are not from NSF 245 testing or Maryland's field testing protocol for this interim listing by request (e.g., EN-12566-3 or other state approvals). Manufacturers should contact Marcia Degen, Technical Services Manager, at Marcia.Degen@vdh.virginia.gov or 804-387-1883 to be considered for the interim list.

The division will periodically update Appendix A until a permanent procedure and listing process is developed (no later than June 7, 2014).

BMP #6: Shallow Placed Pressure Dosed Soil Dispersal System (50%)

Pressure-dosed dispersal provides uniform distribution of effluent across the entire dispersal field. Dosing creates a fluctuating aerobic/anoxic environment, which allows nitrification and denitrification to occur when there is sufficient carbon present. The BMP assumes a 50 percent *gross* TN reduction when systems are installed in compliance with this BMP. This BMP is limited to installations where the drip tube or trench bottom is in the upper 12 inches of a natural soil horizon such as an A or B horizon where the likelihood of higher carbon content exists. This BMP is not valid where a Texture Group I soil predominates in the upper 12 inches. Minimum design and installation criteria are:

- The drip tubing or LPD piping must be installed in a natural surface horizon no deeper than 12 inches from the original soil surface.
- Loading rates must comply with the AOSS Regulations and be appropriate for the soil hydraulic properties and the effluent properties.
- BMP credits are not provided when sand or loamy sand textures predominate the upper 12 inches of the soil horizon.
- The site must have a stable vegetative cover.
- For sloping sites, the drip or LPD piping must be placed on contour, and the linear loading rate across the slope must be minimized.
- Horizontal and vertical separations must comply with applicable regulations for onsite wastewater systems.
- The drip system must be installed into landscape positions that comply with 12VAC5-610-593.
- All drip system designs shall incorporate the following:
    - A vibratory plow, static plow, or trencher is most typically used to install the tubing, and soil moisture must be dry enough so that soil compaction does not occur.
    - A filtration system shall be provided to protect the emitters from clogging.
    - An automatic flush cycle shall provide a minimum flushing velocity at the rate the tubing manufacturer recommends.
    - The effluent is to be equalized and timed-dosed over a 24-hour period to maximize the fluctuation between aerated and non-aerated periods. Minimum dose volume shall be 3.5 times the volume of the drip network or zone as applicable.
    - The system shall be designed to minimize drain-down effects on the lowest line in a zone.
    - Air vacuum release valves shall be provided at the high points of the feed and return lines to prevent entry of soil particles into emitters.
- All LPD systems shall incorporate the following elements:
    - The working pressure head is less than five feet.
    - The dosing volume is seven to 10 times the volume of the distribution piping.
    - The piping shall be properly bedded in accordance with state regulations.
    - The system shall be equipped to allow system flushing as needed for maintenance.
    - The hole size and spacing shall be designed to produce a maximum flow variation of no greater than 10 percent along the length of each pipe.

When designed in accordance with the above criteria, shallow placed, pressure dosed systems are assumed to provide a *gross* 50 percent, or a *net* 38 percent reduction in TN when dispersing septic tank effluent. The effluent quality applied to the drip or LPD system does not affect the BMP removal rate.

BMP #7: Elevated Sand Mounds (50%)

Elevated sand mounds have one to two feet of sand constructed over a natural soil surface such as an A or B horizon. Effluent is dispersed into the top of the sand layer using pressure dosing. The minimum design criteria are the following:

- Minimum design and installation criteria for this BMP are based on Converse and Tyler (2000). The mound must be installed over a natural surface horizon.
- No credit is given to mounds installed where sand or loamy sand soils predominate in the upper 12 inches of the soil profile.
- Small, frequent timed doses of effluent must be dosed to the sand media through a pressurized distribution system (i.e., LPP/LPD or drip) with a spacing that provides 4 to 6 square feet (sf) per orifice (i.e., 2' × 2' or 2' × 3' grid).
- The surface of the soil under the mound must be tilled or scarified to allow movement of the wastewater into the soil.
- The sand layer shall be coarse sand with ≤ 0.5 percent fines passing #200 sieve, unless the division grants an exception. Additional descriptors include: ASTM C33 sand; ≤ 20 percent by weight material that is greater than two millimeters in diameter; D10 = 0.15 to 0.3 millimeters; UC = 4 to 6.
- The sand depth shall be one to two feet unless the division grants an exception to this policy. The sand depth is dependent on the vertical separation to a restricting feature and the level of effluent quality applied to the mound. For STE, the sand shall be at least two feet deep. A lesser depth of sand (no less than 12 inches) may be used for the dispersal of treated effluent.
- The depth to a limiting feature and landscape must comply with the *Regulations*.
- The sand media loading rate for STE shall be no greater than 1gpd/ ft^2. If the effluent disperses TL-2 or better, then the top of sand loading rate may be increased to 2 gpd/ft^2.
- Basal area loading rates (sand/soil interface) must comply with the applicable state regulations.
- The linear loading rate shall be limited to three to four gpd/linear foot (lf) on sites with restrictions that rely on horizontal movement of the wastewater away from the mound, unless the division grants an exception.
- Mounds shall be covered with a six to 12-inch layer of sandy loam, loam, or silt loam, unless the division grants an exception to this policy. Clay loam, silty clay loam, and clay soils are not acceptable because they retard the diffusion of oxygen to the sand layer.
- The site must have a stable vegetative cover.

When designed in accordance with the above criteria, elevated sand mounds that are pressure dosed are assumed to provide a *gross* 50 percent TN reduction. The effluent quality applied to the mound does not affect the BMP removal rate.

APPENDIX A – Modification Date: September 15, 2014
Interim List of Treatment Units
50 Percent TN Reduction

Modifications from last update in **BOLD**

Manufacturer/Unit	Listing Type*	Listing Basis	TL2 or TL3 Approved
Anua – Platinum • P6 (300 gpd) • P8 (375 gpd) • P10 (525 gpd) • P12 (600 gpd)	Interim	EN 12566-3	TL2
Anua- Puraflo DN (recirculating filter) • P120Dn*1A (pad 120 gpd/module) • P120Dn*1B (other dispersal 120 gpd/module)	Interim	NSF 245 (NC State)	TL2
AquaKlear • AK6S245C/450, 600,750 • AK10S245C (1,000) • AK6S245F (1,000)	Interim	NSF 245 – Gulf Coast Testing Center	TL2
Aquapointe • Bioclere 16/12-350 (400 gpd) • Bioclere 16/15 (600 gpd)	Interim	ETV Data (flow based on ETV test)	TL2
Cajun Aire Advanced Poly 500	Interim	NSF 245	TL-2
Biomicrobics • BioBarrier® MBR 0.5-N • BioBarrier® MBR 1.0-N • MicroFast 0.5 • MicroFast 0.625 • MicroFast 0.75 • MicroFast 0.9 • MicroFast 1.5	Interim	NSF 245	Micro-Fast TL-3 Bio-Barrier-TL-2
Biomicrobics • Retrofast 0.25 • Retrofast 0.375	Interim	MD BAT Program	TL-2 for 1 bedroom (.25) and 2 bedroom (.375)
Bionest • OT-100 • OT-40 • OT-45 • OT-50 • OT-55 • OT-60 • OT-70 • OT-75	Interim	NSF 245	TL-2
Clearstream • 500D • 600D • 750D • 800D • 1000D	Interim	NSF 245 –Gulf Coast Testing Center	TL-2

Consolidated Treatment Systems
• **Enviro-Guard ENV-0.75**
• **Enviro-Guard ENV-0.75M**
• **Multiflo**
  ○ **FTB 0.5**
  ○ **FTB 0.6**
  ○ **FTB 0.6-C**
  ○ **FTB 0.75**
  ○ **FTB 0.75-C**
  ○ **FTB 1.0**
  ○ **FTB 1.0-C**
	Interim	**University of Dayton**	**TL-2**

Delta – Ecopod • E50-N • E60-N • E75-N • E100-N	Interim	NSF 245	TL-2 (Evaluation Ongoing for TL-3)
Ecological Tanks • Aqua-Aire AA500-35NR • Aqua-Safe AS600+4NR w/EZ top	Interim	NSF 245	TL2
Ecological Tanks • Aqua-Safe AS500, AS500L • Aqua-Safe AS600, AS600L • Aqua-Safe AS750 • Aqua-Safe AS800L (800 gpd) • Aqua-Safe AS1000 AquaSafe Treatment Units have optional models that allow for the attachment of either a pre-tank, a pump tank, or both. As long as the optional model includes one of the approved treatment units above, then the whole model is considered compliant with this listing.	Interim	NSF 40 N Data	TL3
EZ Treat • #600 • #1200	Interim	VA Data	**TL3**
Hoot • ANR-450 • BNR-500 • BNR-600 • BNR-750 • BNR1000	Interim	NSF 245 and MD listing	TL-2
Norweco • Hydro-Kinetic 600 FEU • Singulair Green TNT-500 • Singulair TNT-**500,** 750, 1000	Interim	NSF 245	TL-2
Orenco • AX20 (N) 600 gpd • AX20RT (N) 600 gpd • AX25RT (N) 625 gpd	Interim	MD BAT Program	TL3

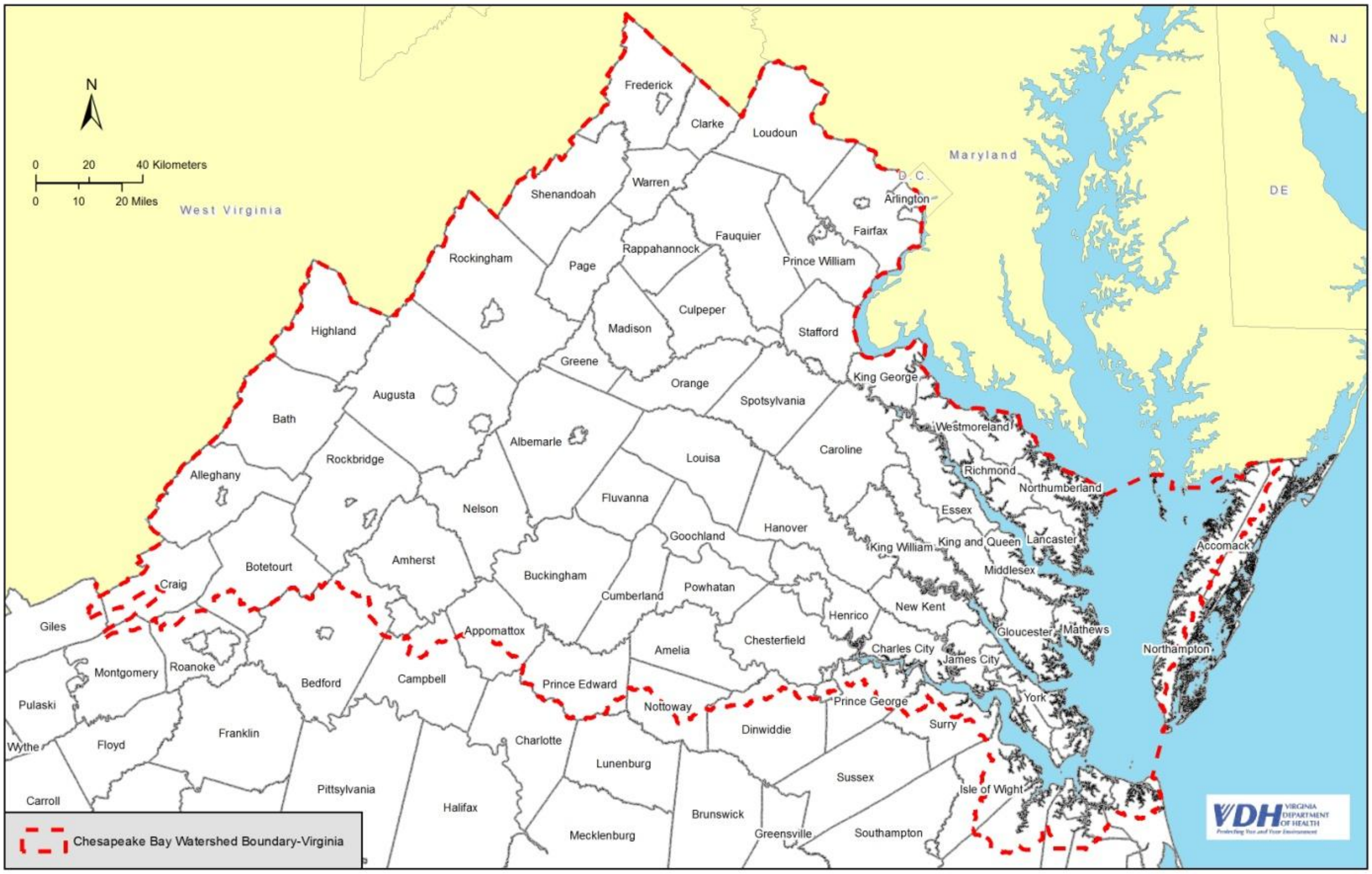
Pekasys-Anua • PSB1-4 (CRB1-400) • PSB1-5 (CRB1-500) • PSB1-6 (CRB1-600) • PSB1-7 (CRB1-700) • PSB2-8 (CRB1-800) • PSB2-9 (CRB1-900)	Interim	NSF 245	TL2
Quanics – Biocoir • ATS-4-BC (ATS-SCAT-4-BC-400) • ATS-6-BC (ATS-SCAT-6-BC-650) • ATS-8-BC (ATS-SCAT-8-BC-1000)	Interim	NSF 40 N data	TL3
Quanics – Aerocell • ATS-4-AC • ATS-6-AC • ATS-8-AC	Interim	NSF 245 (2006)	TL2
Septi-Tech • N-M400D • N-M550D • N-M750D	Interim	NSF 245	TL-2
National Wastewater Systems, Inc. • Solar Air SA-500 GPD	Interim	NSF 245 (Gulf Coast)	TL-2

*Interim Listings will be used until a final test protocol is established.

This list is based on NSF 245, Maryland's website for Best Available technology (http://www.mde.state.md.us/programs/Water/BayRestorationFund/OnsiteDisposalSystems/Pages/Water/cbwrf/osds/brf_bat.aspx), and other data sources that have been submitted for consideration. Manufacturers should contact Marcia Degen, Technical Services Manager, at Marcia.Degen@vdh.virginia.gov to be considered for the interim list. The list will be updated as needed. **Note that only the main model from the NSF 245 list is provided in most cases and not all the variations (concrete, poly, etc.) for brevity sake. All models certified under NSF 245 are BMP compliant for flows ≤ 1,000 gpd**. See the NSF 245 listings at http://info.nsf.org/Certified/Wastewater/Listings.asp?TradeName=&Standard=245 and http://www.gulfcoasttesting.com/Company/PublicList for the complete list

Appendix B: Diagram of the Chesapeake Bay Watershed

Chesapeake Bay Watershed



See http://dswcapps.dcr.virginia.gov/htdocs/maps/huexplorer.htm to determine the watershed for a particular location.

Appendix C: Applying TN Limits for Large AOSSs

The TN limits in 90.D apply to construction permits received on or after December 7, 2013, and any system with an operation permit that renews on or after that date. Section 90.B. requires all large AOSSs statewide to comply with a 5 mg/l TN limit at the project boundary. The limit protects drinking water supplies. Dilution may be used to demonstrate compliance with this limit. Each large AOSS must be evaluated for compliance with 90.D. and 90.B. The most limiting case will be used to set the actual limit on the system.

1. *Large AOSSs up to 10,000 gallons per day.*

Section 90.D. 2 provides two options for compliance: (a) demonstrated effluent quality of 20 mg/l TN, or (b) compliance with 20 mg/l TN within 24 inches of the point of effluent application in the soil. The designer must demonstrate how the design will comply with one of the two options above. If in situ testing is proposed, then the method for collecting the in situ sample must be described and an interim compliance point set. An interim compliance point is typically set at the end of all treatment prior to entering the soil and is used in case the in situ sample cannot be collected at some point. The value (limit) for the interim compliance is typically based on reasonable assumptions for TN losses in the drainfield. For example, if shallow drip is used, it is reasonable to assume a 50 percent loss of the applied effluent. With the required endpoint being 20 mg/l in situ, then the effluent applied could be 40 mg/l. Dilution cannot be used to demonstrate compliance with this limit.

2. *Large AOSSs with flows greater than10,000 gallons per day.*

Section 90.D.3 provides two options for compliance for this size facility: (a) demonstrated effluent quality of 8 mg/l TN or (b) compliance with 5 mg/l TN within 24 inches of the point of effluent application in the soil.

The designer must demonstrate how the design will comply with the selected option. If in situ testing is proposed, then the method for collecting the in situ sample must be described and an interim compliance point set. An interim compliance point is typically set at the end of all treatment prior to entering the soil and is used in case the in situ sample cannot be collected at some point. The value (limit) for the interim compliance is typically based on reasonable assumptions for TN losses in the drainfield. For example, if shallow drip is used, it is reasonable to assume a 50 percent loss of the applied effluent. With the required endpoint being 5 mg/l in situ, then it is reasonable to say, in this case, that the effluent applied could be 10 mg/l.

Appendix D: Use of Non-generally approved technology pursuant to 12VAC5-613-90.D.1.b

12VAC5-613-90.D.1.b allows for designs that do not use approved BMPs. This option is for designers who are seeking approval for a given reduction in TN at a specific site. These designs specify a non-generally approved treatment unit and follow standard engineering practice. These designs are not usually supported by the treatment unit manufacturer. A designer may seek approval for the use of a proprietary treatment unit through this BMP protocol, but the approval is site specific and will not be extended to other sites. The owner must have an understanding of the approved back-up plan should the system not meet the performance criteria of this BMP. There is a two step protocol. Step one is an engineering justification for the design; step two is field verification of the design.

The engineering justification must follow standard engineering practice for the reduction of N and must be site specific. At a minimum, engineering calculations must include oxygen delivered versus required level; safety factors; nitrogen, hydraulic and organic loading rates; pump rates; recirculation rates; and N removal calculations to project end-of-pipe concentration. The process used must be based on demonstrated N reduction in similar designs such as peer reviewed articles or published engineering texts or references.

Field testing will follow the monitoring frequency for non-generally approved systems (see 12VAC 5-613-100.E). An initial effluent sample for TN will be obtained within 180 days and then four additional samples will be collected semiannually for two years. At least two of the samples must be collected from November to February. Effluent grab samples for TN are sufficient. Influent sampling is recommended, but not required. The designer may opt to utilize the default influent value of 60 mg/l. The percent removal will be calculated by ((influent N-effluent N)/influent N) x 100. The mean of the percent removal must be equal to or greater than 50 percent.