



**MARYLAND DEPARTMENT OF THE ENVIRONMENT**  
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Lawrence J. Hogan, Jr.  
Governor

Ben Grumbles  
Secretary

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Lieutenant Governor

**MEMORANDUM**

**TO:** Environmental Health Directors  
**THRU:** Jay Prager, Deputy Program Manager, Wastewater Permits Program  
**FROM:** Joshua Flatley, BRF/BAT Technical Lead  
**DATE:** March 10, 2015  
**RE:** Bedroom Capacity for Field-verified Best Available Technology

This memorandum is to address the concerns of varying approving authorities as to the sizing of the Best Available Technology (BAT) systems to properties. The field-verified BAT manufacturers supplied specific information pertaining to their individual units in order to address these concerns.

The Bay Restoration Fund uses the manufacturer's tank specifications for proper sizing of the BAT units. Each manufacturer of the field verified units submitted the following information based on a request by MDE. The attachments are specific to each unit and should be used as a reference when sizing a BAT to individual properties. This summary is for residential, domestic wastewater characteristics. Should more information be required, please contact the manufacturer for specific sizing details.

**Field Verified System Manufacturers and Models:**

- Orenco Systems, Inc: AdvanTex-AX20, AdvanTex-RT, AdvanTex-AX25RT
- Hoot Aerobic Systems, Inc: Hoot 600 BNR, Hoot 1000 BNR,
- SeptiTech, Inc: SeptiTech M400D, SeptiTech M550D, SeptiTech M750D
- Norweco, Inc: Singulair TNT 500, Singulair TNT 750, Singulair TNT 1000, Singulair Green
- Bio-Microbics, Inc: RetroFAST

**System Bedroom Sizing and Emergency Storage Capacity as reported by Manufacturer:**

**Orenco:**

- AdvanTex AX20: up to a 5 bedroom design flow, not to exceed an average daily flow of 600 GPD
  - AX20 has a 600 gallon emergency storage capacity (using a 1500 gallon processing tank and 1000 gallon BayStar pump tank).
    - From high-level alarm to one inch above the invert of the inlet
- AdvanTex AX20RT: up to a 5 bedroom design flow, not to exceed an average daily flow of 600 GPD
  - AX20RT has a 613 gallon emergency storage capacity



- 210 gallons from the high water alarm to the invert of the inlet; 187 gallons from the invert of the inlet up 10 inches into the RT tank at 18.7 gallons per inch; 216 gallons in the septic tank (Baystar Precast tank)
- AdvanTex AX25RT – up to a 6 bedroom design flow, not to exceed an average daily flow of 750 GPD
  - AX25RT contains 25% more filter media than the AX20 and AX20RT
  - Emergency storage data not provided by manufacturer

**Hoot:**

- Hoot 600 BNR – up to a 6 bedroom design flow, not to exceed an average daily flow of 500 GPD
  - The standard tank has a 750 gallon one piece pump chamber, which provides a 794 gallon emergency storage capacity
  - Add-on pump chambers are available and allow for an increased emergency storage
    - 1,000 gallon add-on provides a 807 gallon emergency storage capacity
- Hoot 1000 BNR – up to a 10 bedroom design flow.
  - Refer to Hoot Manufacturer for specific specs.

**SeptiTech:**

- M400D – up to a 4 bedroom design flow, not to exceed an average daily flow of 500 GPD
  - M400D has a 650 gallon emergency storage capacity
    - 500 gallons in processor chamber, 150 gallons additional storage between the SeptiTech processor and the primary septic tank
- M550D – up to a 6 bedroom design flow, not to exceed an average daily flow of 750 GPD
  - Emergency storage data not provided by manufacturer
- M750D – up to a 8 bedroom design flow , not to exceed an average daily flow of 1000 GPD
  - Emergency storage data not provided by manufacturer

**Norweco: Gravity Discharge**

- Singulair Model TNT500– up to a 5 bedroom design flow, not to exceed an average daily flow of 600 GPD
- Singulair Model TNT750–not to exceed an average daily flow of 750 GPD
- Singulair Model TNT1000–not to exceed an average daily flow of 1000 GPD
  
- Singulair Green (plastic tank) – up to a 5 bedroom design flow, not to exceed an average daily flow of 600 GPD

**RetroFAST: Gravity Discharge**

- Maryland limits usage to 3 bedroom or less and/or 4 person maximum occupancy

**Appendix:**

1. Orenco documentation
2. Hoot documentation
3. SeptiTech documentation
4. Norweco documentation





05 FEB 2015

Joshua Flatley  
Project Manager  
Bay Restoration Fund  
Maryland Department of Environment

Joshua,

I'm writing today to provide answers to the questions that you sent requesting up-to-date information on the AX treatment technology used in the Maryland BAT program.

**1. What is the name and model of the unit being represented? (List each model number used in MD under this technology group)**

Orenco Systems uses AdvanTex<sup>®</sup> technology with 3 models:

- AX20
- AX20RT
- AX25RT

**2. What third party sampling verification organization was utilized for the initial entry in to BAT classification?**

Orenco utilized Pennsylvania's Technology Verification program with third party verification provided by NSF.

**3. What was the flow sizing (GPD) of the unit that underwent this testing?**

Both the AX20 and AX20RT units were tested in the PA Technology Verification program, based on 500 gpd actual flow or up to 5 bdrm design flow (design flow in gpd per bedroom varies with jurisdiction).

**4. What was the TN reduction of the third party testing?**

The PA Technology Verification program demonstrated a 64% reduction in TN.

**5. How many bedrooms can this model serve while still meeting 50% Nitrogen reduction using 60 mg/L TN influent? (Please list each model and their capabilities as another bullet)**

- AX20 - this unit can meet a 50% reduction in TN for up to a 5 bdrm design flow or up to 600 gpd actual flow
- AX20RT - this unit can also meet a 50% reduction in TN for up to a 5 bdrm design flow or up to 600 gpd actual flow
- AX25RT - this unit can meet a 50% reduction in TN for up to a 6 bdrm design flow or up to 750gpd actual flow. The AX25RT unit flow rates are based on a loading rate of 30 gpd/ft<sup>2</sup>, which is the same loading rate as for the AX20 and AX20RT. The AX25RT contains 25% more filter media area than the AX20 and AX20RT.

**6. Please identify any site requirements that your unit needs or needs to prohibit.**

Salt-based water softener backwash must not be plumbed into the treatment unit, as this would void the warranty. There must be sufficient space available for required tankage and the unit footprint.

Please contact me if you require additional information or clarification. Thanks.

Joseph Soulia  
Government Relations Representative  
(800) 230-9580  
jsoulia@orencosystems.com

*Changing the Way the World Does Wastewater<sup>®</sup>*



Joshua Flatley -MDE- <joshua.flatley@maryland.gov>

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## Emergency Storage for the AdvanTex treatment system

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Joe Soulia <jsoulia@orenco.com>  
To: joshua.flatley@maryland.gov

Fri, Sep 19, 2014 at 4:23 PM

Hello Josh.

Orenco's standard AX RT configuration includes the following emergency storage:

210 gallons from the high water alarm to the invert of the inlet. See attached RTEmergencyStorage pdf.

187 gallons from the invert of the inlet up 10 inches into the RT tank at 18.7 gallons per inch. See attached RTEmergencyStorage pdf.

216 gallons (9 inches at 24 gallons per inch) in the septic tank (Baystar Precast tank). See 1000Tank pdf, attached. This is the volume in the septic tank before effluent backs up into the home.

Total 613 gallons emergency storage.

Our standard AX20 configuration, using a 1500 gallon processing tank and 1000 gallon Baystar Precast pump tank:

Alarm float set at up 27" from bottom of pump tank. (see attached 1000Tank pdf)

600 gallons emergency storage from high-level alarm to one inch above the invert of the inlet (25 inches at 24 gallons per inch).

The system begins to lose its ability to reduce nitrogen when the system is no longer recirculating. In both the AXRT and AX20 systems, the liquid level would begin to back up into the home after the emergency storage is used up.

How soon the effluent backs up into the home depends on how far the septic tank is located from the home, the slope of the inlet pipe, and how much water is used while the system is offline. During power outages, homeowners use significantly less water than under normal circumstances. Without power for hot water, dishwashers, washing machines, etc., water use is only a fraction of normal. So under those conditions, the emergency storage is sufficient for many days before any effluent gets close to backing up into the home or being released into the environment.

Please contact me if you have any questions. Thanks

Joe

—  
Joseph Soulia  
Government Relations Representative  
[jsoulia@orenco.com](mailto:jsoulia@orenco.com)  
(800) 230-9580  
(541) 537-0772

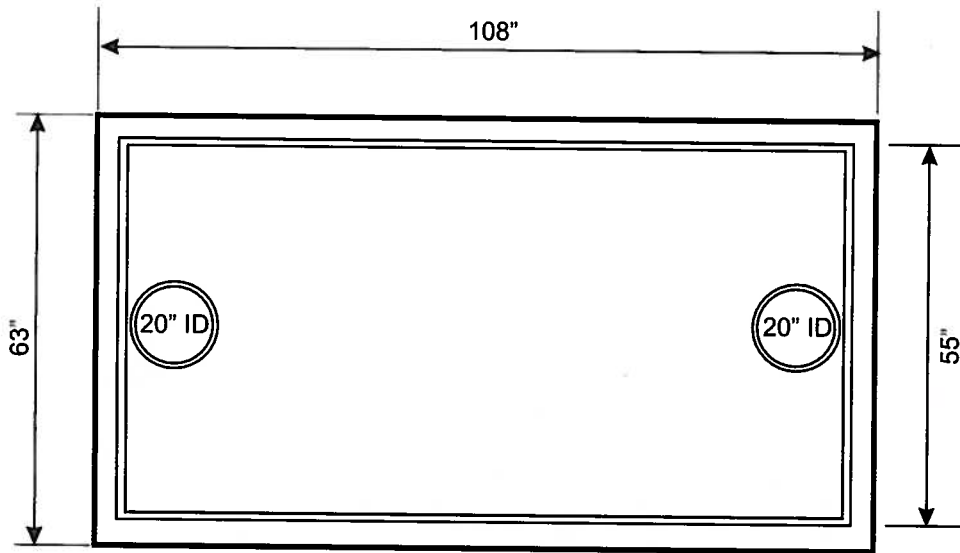
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### 2 attachments

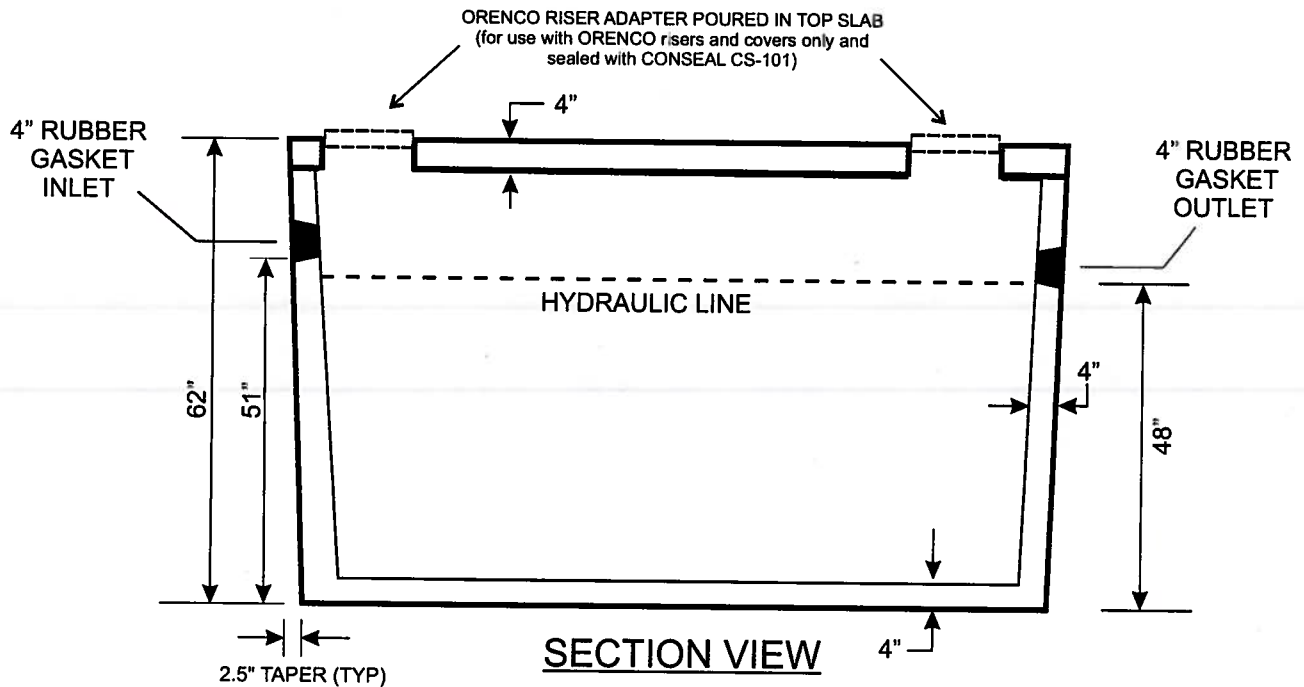
**1000Tank.pdf**  
97K

**RTEmergencyStorage.pdf**  
94K

# 1000 GALLON 1-C TANK for Advantex® Treatment System



**TOP VIEW**



Since  
1989

925 Skidders Turn Road  
P.O. Box 959  
Owings, Maryland 20736-0959

800.451.9583  
410.257.6777  
301.855.6777  
fax: 410.257.1312

## 1000 GALLON 1-COMPARTMENT TANK for Advantex® Treatment System

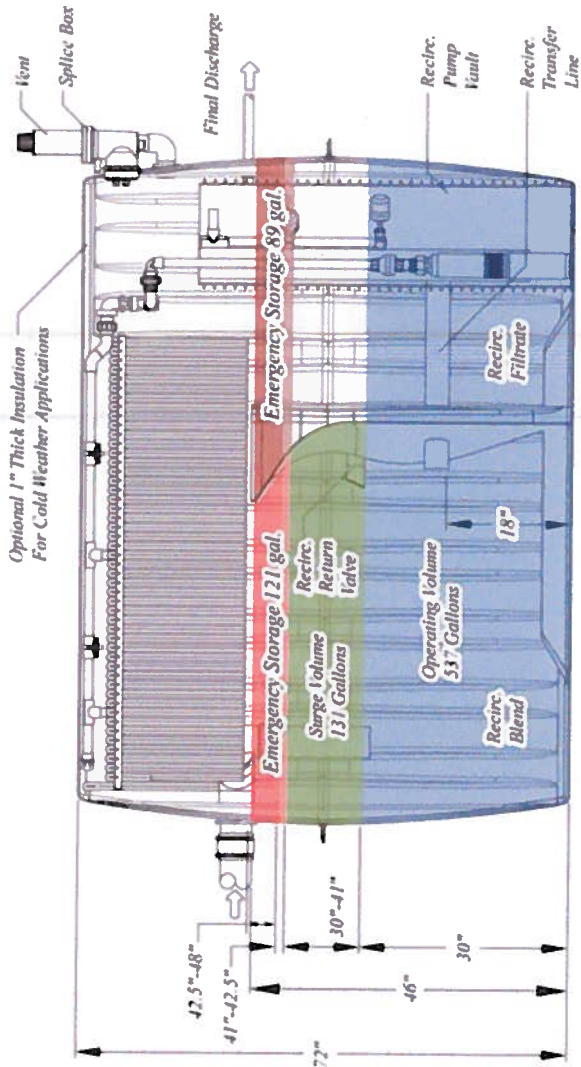
**GENERAL NOTES:** CONCRETE STRENGTH 4000 PSI AT 28 DAYS

REINFORCING DETAILS: 6X6 #10 GAUGE WIRE MESH INSIDE BOTTOM  
TOP HAS #3 BAR 12" O/C; SIDES AND BOTTOM HAS #3 BAR 12" O/C

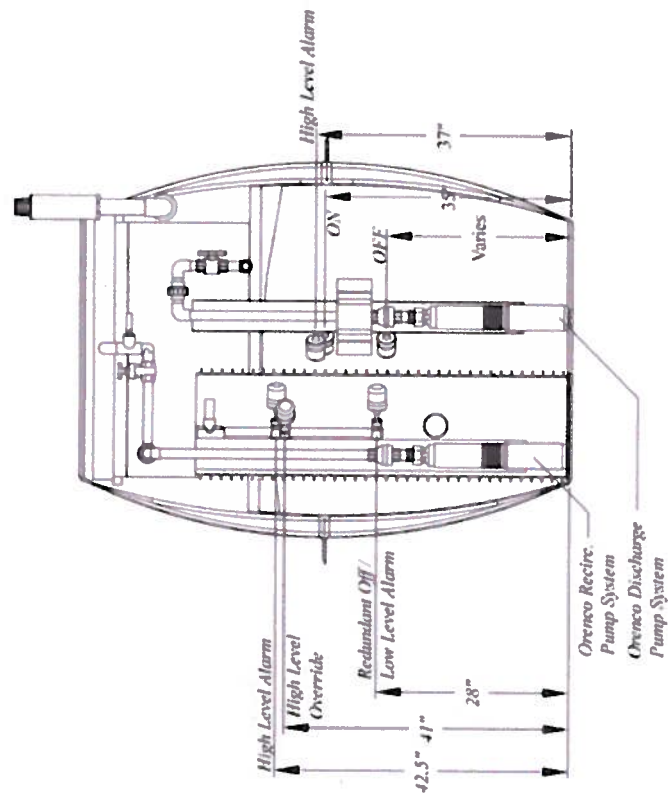
Date Appr.  
081208

1000 1C ADX IO  
rev 052009

Drawing not  
to scale



AX20 800 gal. Recirc. Tank - Side View



Discharge Chamber - End View



# HOOT SYSTEMS, LLC.

[www.hootsystems.com](http://www.hootsystems.com)

February 18, 2015

Mr. Joshua Flatley  
Project Manager  
Bay Restoration Fund  
Maryland Department of Environment

RE: Unit sizing for BAT in Maryland

Dear Josh

This letter is in response to your email dated January 26<sup>th</sup> requesting information and clarification regarding unit sizing in respect to its capability within the confines of the BRF program.

We will attempt to answer these questions in the simplest format possible so that you can disseminate it out to the general public for their use.

1. What is the name and model of the unit being represented? (List each model number used in MD under this technology group)

*At the current time Hoot utilizes our BNR unit in Maryland for the reduction of nitrogen under the BRF program. These are known as the Hoot 600 BNR and the Hoot 1000 BNR.*

2. What third party sampling verification organization was utilized for the initial entry in to BAT classification?

*Hoot Systems BNR Testing was done by the Baylor University Onsite Wastewater Testing and Certification Program. At the time of the testing, Baylor was an independent, 3<sup>rd</sup> party testing agency for the ANSI/NSF Standard 40, accredited by ANSI. Simultaneous to a Standard 40 test, samples were taken for both influent and effluent nitrogen. This test site and Baylor Program has subsequently been absorbed by NSF.*

3. What was the flow sizing (GPD) of the unit that underwent this testing?

*500 gallons per day.*

4. What was the TN reduction of the third party testing?

*55.53 % reduction.*

5. How many bedrooms can this model serve while still meeting 50% Nitrogen reduction using 60 mg/L TN influent? (Please list each model and their capabilities as another bullet)

- *Hoot 600 BNR can treat the waste for up to 6 bedrooms/people.*
- *Hoot 1000 BNR can treat the waste of up to 10 bedrooms/people.*

*When either system is used for applications outside of household waste, Hoot will work with a licensed designer/engineer to make recommendations on appropriate sizing based on flow and strength.*

6. Please identify any site requirements that your unit needs or needs to prohibit.

*Hoot units are very adaptable and can be placed anywhere delivery equipment / or excavation equipment large enough can place them.*

*These units have both traffic and non traffic related models so there are very few site restrictions on them.*

Respectfully submitted

Michael Dunn

*Michael Dunn*

---

Hoot Systems, LLC.  
Eastern Regional Manager

CC : via email

Central File Hoot Systems,LLC.

Nancy Mayer Mayer Brothers

Troy Cormier Hoot Systems, LLC.



## Mayer Bros Inc. Add on Pump Chambers for Hoot Units

Size of Pump chamber	One Piece			separate		separate	
	750 gal (std Hoot)	1000 gal	1500 gal	2000 gal			
Gallons per inch	14.36	23.4	36.03	45.62			
<b>VERY IMPORTANT</b> Mounting Location of Probe staff (bottom of ground tip)	13" off floor	8" off floor	8" off floor	8" off floor			
Gallons from alarm to invert	180	304	468	775			
Gallons of freeboard above inlet		140	216	273			
Gallons of freeboard in Hoot Tank or 1/2 a Hoot if separate Pump Chamber	614	363	363	363			
<b>Total emergency gallons</b>	794	807	1047	1411			

**Please see Mayer Bros Drawings for Pump Chamber Details and Hoot primary chambers.**

# Add on Pump Chambers for Hoot Units

	One Piece	separate	separate	separate
Size of Pump chamber	750 gal (std Hoot)	Half a Hoot	1000 gal	2000 gal
Freeboard Length	157	93	98	157
Freeboard Width	69.5	69.5	55	67
Freeboard ht	13	13	19	23
Freeboard volume	614.02	363.72	443.30	1047.27
Gallons per inch	14.36		23.4	45.62
		23.33171	35.94988	45.53363
Gallons after High water alarm	180		304	468
Gallons of freeboard above inlet	463*		140	216
<b>VERY IMPORTANT</b> Mounting Location of Probe staff	13" off floor		8" off floor	8" off floor

34" from floor to alarm

February 18, 2015

Mr. Joshua Flatley  
Bay Restoration Fund  
Maryland Department of Environment  
Project Manager  
1800 Washington Boulevard  
Baltimore, MD 21230

RE: Unit Sizing for BAT in MD

Dear Mr. Flatley,

Please see the figures below regarding your request for information for the proper sizing of SeptiTech units as it pertains to the standards set forth in the Bay Restoration Fund (BRF) for On-Site Sewage Disposal Systems (OSDS) using Best Available Technology (BAT) for Nitrogen Removal. Please note that the information provided is based on residential strength wastewater loading rates. For higher strength wastewater or commercial applications please consult the SeptiTech Corporate offices.

1. What is the name and model of the unit being represented? (List each model number used in MD under this technology group)

**SeptiTech<sup>®</sup> STAAR<sup>™</sup> 0.5D Residential System (SeptiTech M400D)**  
**SeptiTech<sup>®</sup> STAAR<sup>™</sup> 0.75D Residential System (SeptiTech M550D)**  
**SeptiTech<sup>®</sup> STAAR<sup>™</sup> 1.0D Residential System (SeptiTech M750D)**  
**SeptiTech<sup>®</sup> STAAR<sup>™</sup> 1.2D Residential System (SeptiTech M1200D)**  
**SeptiTech<sup>®</sup> STAAR<sup>™</sup> 2.0D Residential System (SeptiTech M1500D)**  
**SeptiTech<sup>®</sup> STAAR<sup>™</sup> 3.0D Residential System (SeptiTech M2500D)**  
**SeptiTech<sup>®</sup> STAAR<sup>™</sup> 4.5D Residential System (SeptiTech M3000D)**

2. What third party sampling verification organization was utilized for the initial entry in to BAT classification?

**ETV/EPA Verification**

3. What was the flow sizing (GPD) of the unit that underwent this testing?

**SeptiTech® STAAR™ 0.5D (SeptiTech M400D), 500 gpd**

4. What was the TN reduction of the third party testing?

**64% removal of Total Nitrogen as per ETV/EPA Verification**

5. How many bedrooms can this model serve while still meeting 50% Nitrogen reduction using 60 mg/L TN influent? (Please list each model and their capabilities as another bullet)

<b>SeptiTech® STAAR™ 0.5D Residential System</b>	500 gpd	1 – 5 people served	Up to 4 Bedrooms
<b>SeptiTech® STAAR™ 0.75D Residential System</b>	750 gpd	1 – 8 people served	Up to 6 Bedrooms
<b>SeptiTech® STAAR™ 1.0D Residential System</b>	1000 gpd	1 – 11 people served	Up to 8 Bedrooms
<b>SeptiTech® STAAR™ 1.2D Residential System</b>	1200 gpd	1 – 18 people served	Up to 13 Bedrooms
<b>SeptiTech® STAAR™ 2.0D Residential System</b>	2000 gpd	6 – 21 people served	Up to 22 Bedrooms
<b>SeptiTech® STAAR™ 3.0D Residential System</b>	3000 gpd	10 – 42 people served	Up to 33 Bedrooms
<b>SeptiTech® STAAR™ 4.5D Residential System</b>	4500 gpd	18 – 63 people served	Up to 50 Bedrooms

6. Please identify any site requirements that your unit needs or needs to prohibit.

**Please refer to the SeptiTech® STAAR™ Installation Manuals**

Sincerely,

*Justin Nichols*

Justin Nichols  
 Vice President of Sales  
 SeptiTech, a subsidiary of Bio-Microbics, Inc.



Joshua Flatley -MDE- <joshua.flatley@maryland.gov>

(no subject)

Justin Nichols <jnichols@septitech.com>

Wed, Sep 3, 2014 at 8:33 AM

To: "joshua.flatley@maryland.gov" <joshua.flatley@maryland.gov>

Cc: "jbell@biomicrobics.com" <jbell@biomicrobics.com>, Bob Rebori <rrebori@biomicrobics.com>

Hello Josh,

#### Emergency Storage Capacity

The emergency storage capacity of the SeptiTech system is considered to be the available total tank volume that is above the high water level float elevation.

For example, the M400 processor that is built within the Gillespie 1000 gallon top seam septic tank has a capacity of approximately 25 gallons per inch of tank depth. The M400 processor when installed into this tank has a high water float elevation 24-inches above the bottom of the tank floor. The internal tank dimension of the 1000 gallon Gillespie tank from the tank floor to the inlet pipe invert is 44-inches. Therefore, there is  $44 - 24 = 20$  inches of available emergency storage within the processor tank. That provides 500 gallons of emergency storage within the SeptiTech M400 processor.

Further, since there is a primary septic tank located upstream of the processor there is additional storage within that tank as well. Since the outlet pipe of a standard septic tank is 3-inches lower than that of the inlet pipe, there is an extra 3-inches of storage within the septic tank that can be utilized before you hydraulically start to "backup" into the inlet pipe that comes from the home. Assuming 25 gallons per inch within the upstream primary septic tank, there is an additional 75 gallons of storage. This hydraulic grade line will also extend into the SeptiTech processor tank providing yet another 3-inches of storage above that of the inlet pipe. That equates to a total of 650 gallons of storage between the septitech processor and the primary septic tank. (This assumes that the two tanks are next to each other with minimal pitch between the two tanks).

#### Nitrogen Reduction

Since Nitrogen reduction is primarily a biological process, once the proper nitrogen reducing bacteria have been cultured, those bacteria will still remain within the system regardless if the system undergoes an emergency event or not. Once power is reestablished to the system, the discharge pump will initiate and pump down the system to the proper water level based on the float controls. Normal system function will automatically continue. Nitrogen reduction will not be affected.

#### Startup Process & Management

Once power is reestablished to the system, the discharge pump will initiate and pump down the system to the proper water level based on the float controls. Normal system function will automatically continue. However, since there are components of the system that can float or shift during an emergency event within the processor, it is recommended that the local SeptiTech distributor / maintenance provider be notified such that a system inspection can be initiated and any system adjustments can be made. There is no need to pump out the entire system and restart during an emergency event.

Note: The only time there will be an emergency flooding event is if there is a loss of power to a home that has local municipal water supply. Otherwise their well pump also will not function which will prevent any influent from entering into the SeptiTech system. If a home owner has generator backup power onsite, they should include the SeptiTech processor power supply with the generator transfer switch such that an emergency backup event will not occur.

Sincerely,

Justin Nichols  
Vice President of Sales  
SeptiTech, LLC

February 13, 2015

Mr. Joshua Flatley  
Project Manager  
Bay Restoration Fund  
Maryland Department of Environment

Dear Josh:

The following are answers to the questions from your January 26<sup>th</sup> email:

1. Norweco systems that are installed in Maryland are Singulair<sup>®</sup> Model TNT<sup>®</sup> (total nitrogen treatment) tanks.
2. The Singulair<sup>®</sup> Model TNT<sup>®</sup> system was tested and certified by NSF International.
3. The Singulair<sup>®</sup> Model TNT<sup>®</sup> tank was tested at 500 GPD and certified for both 500 and 600 GPD based on system capacity. Scaled up approvals are granted based on the test results for the Model TNT<sup>®</sup>-500 GPD.
4. The tank was certified with a 68% reduction in TN.
5. The Singulair<sup>®</sup> Model TNT<sup>®</sup>-500 (600) can serve a 5 bedroom home and meet the 50% reduction requirement. The larger capacity Singulair<sup>®</sup> systems are as follows:
  - Singulair<sup>®</sup> Model TNT<sup>®</sup>-750 GPD \*
  - Singulair<sup>®</sup> Model TNT<sup>®</sup>-1000 GPD
  - Singulair<sup>®</sup> Model TNT<sup>®</sup>-1250 GPD \*
  - Singulair<sup>®</sup> Model TNT<sup>®</sup>-1500 GPD
6. Site requirements include:
  - Adequate access and space for installation
  - Elimination of water softener backwash, downspouts, etc. connected to the tank
  - Normal tank depths

If you need any more information, please let me know.

Sincerely,

Norweco, Inc.



Scott Hetrick  
Vice President of Sales

\* The Singulair<sup>®</sup> Model TNT<sup>®</sup> -750 and 1250 GPD tanks are not typically available in Maryland.