



Wastewater
Treatment
Technologies

**Homeowner
Operation and Maintenance
Manual**

for

**NitROE® Waste-Water Treatment System
(Massachusetts)**

By

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NitROE® WWTS O&M Manual

NOTE

This Operation and Maintenance (O&M) Manual is designed to give an overall understanding of the NitROE® Waste-Water Treatment System (WWTS). It also provides information related to normal operation, operating dos and don'ts, and troubleshooting guidelines, including answers related to frequently asked questions a homeowner may have.

It is to be noted that this manual is primarily intended for use by the homeowner regarding general O&M related issues. For issues identified and cited as requiring changes to respective NitROE® WWTS components, such as aeration equipment, the homeowner is directed to contact the local KleanTuSM LLC service representative.

IT IS ROCOMMENDED THAT HOMEOWNERS REVIEW THIS MANUAL TO BECOME FAMILIAR WITH THE NitROE® WWTS TECHNOLOGY CONCEPT AND ITS OPERATION.

PLEASE CONTACT THE LOCAL DESIGNATED REPRESENTATIVE (CITED BELOW) WITH ANY QUESTIONS AND IF ANY ISSUES ARISE.

NitROE® WWTS INFORMATION

Model No.: _____
Serial No.: _____
Installation No.: _____
Installation Date: _____
Remote Sensing Unit No.: _____
GPS Coordinates: _____

KLEANTUSM REPRESENTATIVE (OR LISCENSED DESIGNEE)

Name: _____
Address: _____
Phone No.: _____



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NitROE® WWTS AT A GLANCE

As illustrated in Figure 1, a NitROE® WWTS tank is placed in the wastewater flow path between a Title 5 septic tank and a Title 5 leach pit or field. Here, the NitROE® WWTS tank serves as a supplemental tank component to a compliant Massachusetts Title 5 septic system for the main purpose of enhanced total nitrogen (N) removal, significantly beyond that achieved by a Title 5 septic system alone.

Specific to the NitROE® WWTS tank itself, Figure 1 illustrates that it has two primary chambers. The first chamber is aerated, via an external air pump and airline header/hose arrangement, to achieve both organic carbon reduction along with the biological conversion of ammonia-N to nitrate-N.

From the aeration chamber, the wastewater then gravity flows into a denitrification chamber where, in the presence of natural organics from wood chips, bacteria mediate the conversion of nitrate-N to inert N gas that passively exits to the atmosphere via the Title 5 septic system house vent piping.

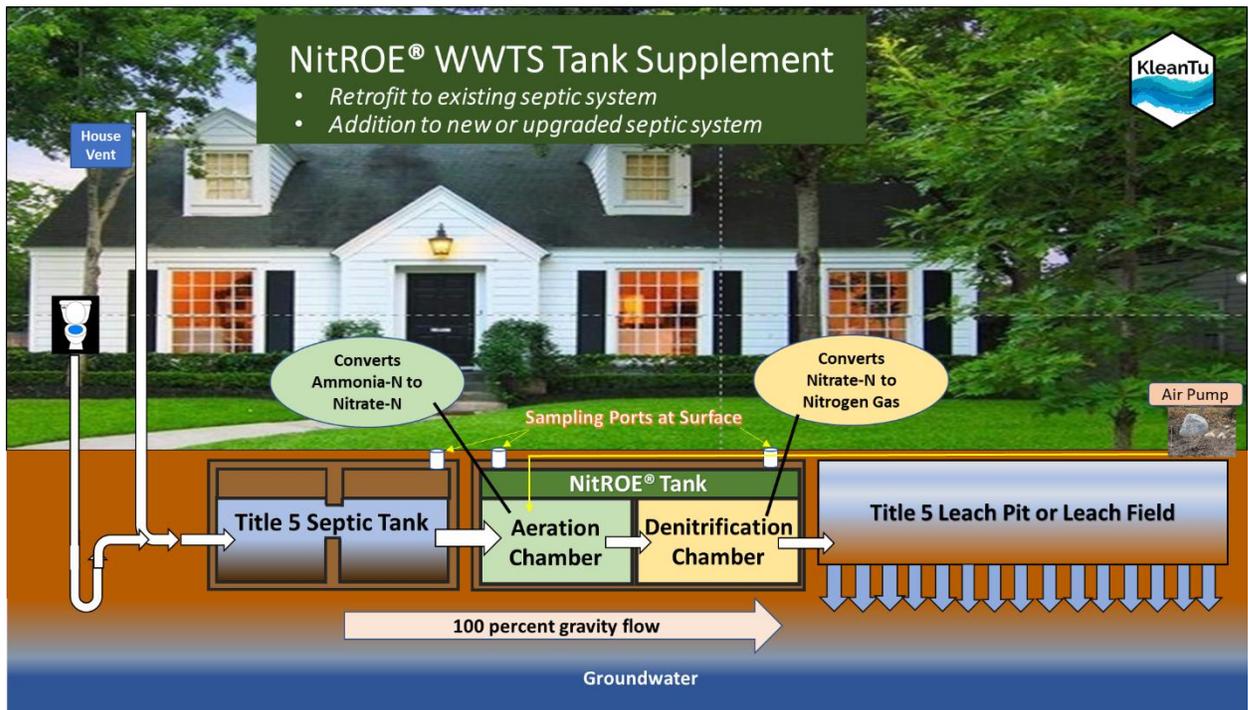


Figure 1. NitROE® WWTS Concept



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Figure 2 provides photos of an installed NitROE® WWTS tank identifying the major design and operational elements.

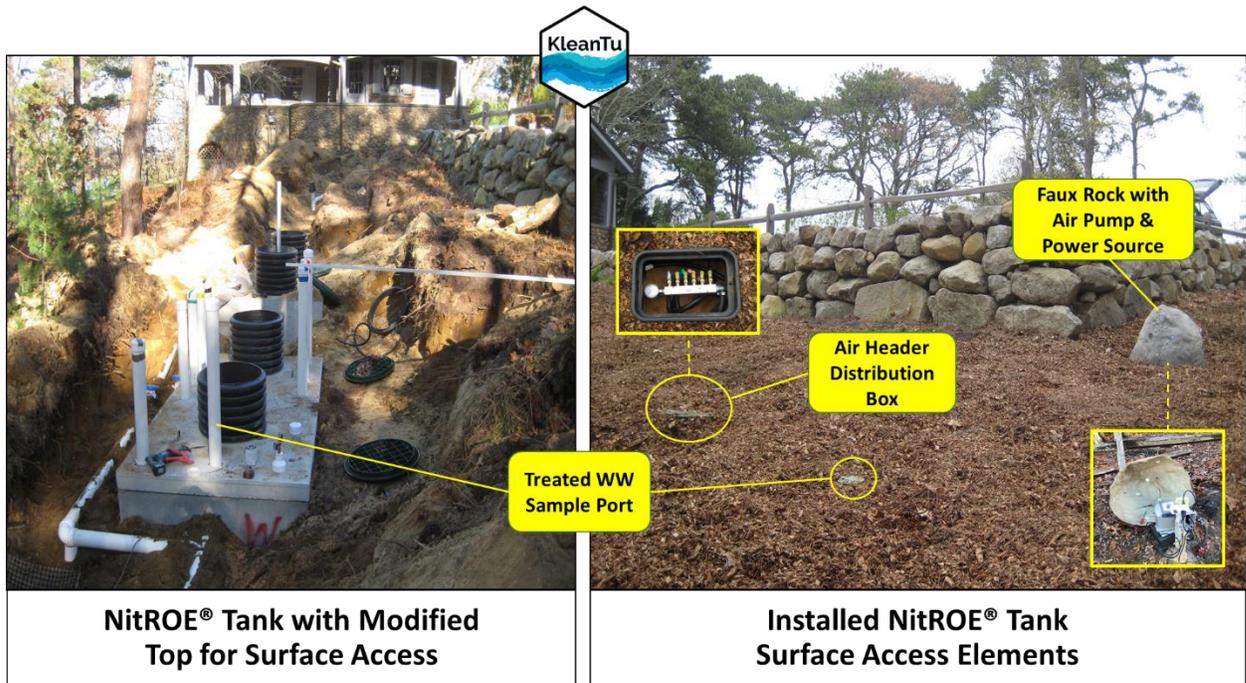


Figure 2. Installed NitROE® WWTS Tank Showing Orientation and Operational Elements

The items listed below are noteworthy:

- The NitROE® WWTS tank is a standard concrete septic tank that is retrofitted with internal recycled plastic wood partitions and aeration piping to provide both the aeration and denitrification chambers per previously shown Figure 1.
- The interior of the NitROE® WWTS consists of stationary, non-mechanical internal components, with the only piece of mechanical equipment being a small external air pump, with an average motor size of 120 watts.
- The NitROE® WWTS tank has a permanent top similar to that of a Title 5 septic tank. However, the NitROE® tank top is modified with specifically located access ports. These access ports allow for sampling and periodic maintenance to be performed from the surface without having to dig down or remove the top. Note that for routine sampling and checking the overall operation of the NitROE® WWTS tank, 2-3 access ports are in small round valve boxes with covers located at the ground surface. The other ports are for maintenance, if needed, and are located 6-12 inches below the ground surface for convenient access but are not visible at ground level.



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- The external air pump, which supplies oxygen to the aeration chamber, requires a dedicated 115V/20-amp outlet and is installed in compliance with the appropriate local codes. The air pump is placed in a surface housing and connected to the aeration apparatus via a valve arrangement. Typically, the housing is a faux rock, as shown in Figure 2, but can also be a custom-made enclosure. The small size of the air pump and its enclosure results in a relatively quiet operation.



THINGS TO KNOW ABOUT YOUR NitROE® WWTS TANK

1. The NitROE® WWTS tank is not a replacement or modification to a compliant Title 5 septic system (i.e., septic tank and leach field or pit), but rather, it is a supplemental tank for the purpose of enhanced total nitrogen reduction beyond that which is typically achievable via a standard septic system.
2. The NitROE® WWTS tank is an integrated extension of a standard septic system and can be installed as part of a new septic system, or it can be installed to supplement an existing one.
3. After septic tank solids settling and removal, enhanced wastewater treatment is achieved via biological and chemical reactions. These reactions take place in a supplemental NitROE® WWTS tank which is designed to consistently generate a highly treated effluent low in suspended solids, biodegradable organics and total nitrogen. The treated wastewater is then discharged to a compliant Title 5 leach field or leach pit.
4. The NitROE® WWTS tank is designed and configured that in the unlikely event of the tank encountering operational difficulty, the Title 5 septic system will perform as originally designed and installed, thereby maintaining the overall environmental protection of a standard Title 5 septic system at a minimum.
5. In general, the NitROE® WWTS tank utilizes the same materials of construction and operational approach as a standard septic system. Thus, personnel servicing a standard septic system can also service a NitROE® WWTS tank with some minor additional training.
6. From a longer-term operational perspective, the NitROE® WWTS tank design provides for maintenance-related change-out and replacement of critical components via access ports without having to remove the tank top.
7. With focus on simplicity of design, fabrication and operation, the NitROE® WWTS tank requires relatively little maintenance as there are no recycle pumps or lines, no frequent routine sludge wasting, no continuous chemical addition, and no significant process control requirements.
8. To constantly monitor the NitROE® WWTS equipment operation to attain consistently good wastewater treatment performance over the long-term, the NitROE® WWTS tank is equipped with continuous remote sensing of the air pump pressure and the wastewater temperature, with high and low set point alarms for each. If a respective set point alarm is triggered, an e-mail will be sent to the local KleanTuSM representative (or a licensed designee) so that the situation can be addressed in an expeditious manner, with minimal homeowner action. This remote sensing unit is connected to the home wi-fi and only sends an outgoing signal and does not receive any input signals.
9. The NitROE® WWTS tank can be installed in a lawn area or under a driveway or parking area.
10. If operating correctly, the system requires little upkeep or involvement from the homeowner.



NORMAL OPERATIONAL OF YOUR NitROE® WWTS TANK

This section discusses the limited number of operational features that the homeowner should be aware of in terms of helping to confirm that the NitROE® WWTS tank is operating and treating household sanitary wastewater as designed.

Visual: All NitROE® WWTS tanks are located below the ground surface just as a septic tank is. For the septic tank, there will be one 4-inch diameter observation/sampling port, and for the NitROE® WWTS tank, there will be two 4-inch diameter observation/sampling ports, with all three being located in small round valve boxes with green covers at ground level. There should also be no ponding water on the ground surface in and around both the septic tank and the NitROE® WWTS tank.

There will also be some combination of a diffuser box (about 1 ft. by 2 ft.) and a pump housing (often a faux rock). The storage of these two components may be combined to take up less space, but wherever the pump is located, it will have an illuminated blue light to signal electricity is being supplied to the pump. Along with the air pump, there will also be a small white box with a black antenna that is the remote sensing unit. Additionally, a blue light indicator (on the faux rock or air pump housing) should always be on, confirming that there is power to the air pump on a 24-7 continuous basis.

Sound: There should be a low humming noise coming from the air pump that is audible to a person nearby or with the air pump cover or faux rock lifted off. Depending on the depth of your system, a faint bubbling noise may be observable coming from the observation/sampling ports with the top off. Both of these sounds are completely normal and mean your NitROE® WWTS is operating correctly.

Smell: It is unlikely that an odor will be present unless the sampling port covers become dislodged.

Note: If you see, smell, or hear anything that is different than described above, please refer to the troubleshooting guide or call the local KleanTuSM representative as soon as possible.



THE DOs & DON'Ts OF YOUR NitROE® WWTS TANK

Avoid flushing the following items down your toilet or drain:

- Cooking Grease
- Strong Acids and Bases
- Baby Wipes / Cleaning Pads
- Q-Tips / Cotton Balls
- Pills
- Cigarette Butts
- Paints and/or Solvents
- Food
- Drain Cleaning Products
- Dental Floss
- Diapers
- Paper Towels
- Highly Concentrated Chlorine
- Personal Hygiene Products

** Even with a normal Title 5 septic system, it is recommended that you do not flush these items down the drain to avoid costly clogged pipes or system malfunction. This is more important with the introduction of your NitROE® WWTS, as it could complicate any repairs your system might need as a result, or disrupt the normal biological activities occurring in your system. If you do happen to flush such products down the toilet or drain, please flush with water for dilution.*

Keep sampling ports and other surface components covered and tightly sealed.

It is important for the function of your NitROE® WWTS that all the components remain protected by their covers. The sampling ports and air valve control box are designed and installed so that you can mow your lawn normally.

Chemical Septic Treatments

Before treating your septic system with any chemical oxidizers, please contact a KleanTuSM representative for advice as these could disrupt the biological activities occurring in your NitROE® WWTS.

Septic Pumping

Your NitROE® WWTS tank should not have to be pumped out if properly operated and maintained. If it does need to be pumped to address an upset condition, it should only be done so at the recommendation and direction of your KleanTuSM representative. However, it is recommended by most local boards of health that your *septic tank* should be pumped out every 3-5 years. This is an important aspect of regular maintenance for any septic system, especially when your system includes a NitROE® WWTS tank. If the septic tank fills with solids, including floating scum and oil & grease, due to insufficient periodic pumping, the solids can overflow into the NitROE® WWTS tank and negatively affect its treatment performance. Bringing the NitROE® WWTS tank back to its high level of performance could potentially result in a substantial cost to the homeowner.



THINK THERE'S A PROBLEM WITH YOUR NitROE® WWTS?

Check Out Our Homeowners Troubleshooting Guide Below

SOMETHING LOOKS WRONG

Blue Indicator Light is Off

If pump is running and humming, it is likely the indicator light has either been disconnected or has burned out, please call a KleanTuSM representative.

Depressions in the Ground

If one or more of your sampling ports seems to be popping too far out of the ground, or you can observe surface depressions around your system, it is likely that the soil is settling unevenly. This does not necessarily indicate an issue with your NitROE® WWTS tank, however, please call a KleanTuSM representative.

Surface Water Ponding on the Ground

If ponded surface water is observed in and around the septic tank and/or the NitROE® WWTS tank, please call a KleanTuSM representative immediately.

Damaged Surface Level Components

If there is any significant damage to any surface level components (green topped sampling ports, air control box, air pump, etc.) please call a KleanTuSM representative.

SOMETHING SOUNDS WRONG

Pump is Off (Not Humming)

If the humming of the air pump is not audible while standing next to it indicating it is not running, and the blue indicator light is off as well, then first check to see if the power source ground fault interceptor (GFI) outlet has tripped and reset it if it has. If this does not work for either the blue indicator light or the pump, then contact a KleanTuSM representative immediately. Please note that if the air pump has stopped running, that an alarm signal should have already been sent to a KleanTuSM representative, and they are aware of the situation and taking action to address it.

Pump is Making a Banging Sound

If the air pump is making a loud banging type noise, then first check to see if the air pump is level on the ground. If not level, then reposition the air pump so it is level, and the banging noise should stop. If this does not work, then please call a KleanTuSM representative immediately.

Rushing Air or Hissing Noise

If you can hear rushing air or hissing from any component of your NitROE® WWTS, including the air pump, the air distribution header box and any buried hoses in the vicinity of the NitROE® WWTS tank, then call a KleanTuSM representative immediately.



SOMETHING SMELLS WRONG

If you smell any offensive odor, like a septic smell or rotten eggs, then call a KleanTuSM representative immediately.



SCHEDULED OPERATION AND MAINTENANCE VISITS

While the NitROE® WWTS is designed to be LOW maintenance (i.e., just slightly more than a standard Title 5 septic system), it is not NO maintenance. Thus, to ensure that the NitROE® WWTS continuously operates as designed and consistently produces a treated wastewater of high quality and low total nitrogen, the following will be performed by a local KleanTuSM representative, or a licensed designee, regarding scheduled O&M visits and sampling as appropriate.

During these site visits, the “NitROE® WWTS Inspection and Sampling Checklist,” provided as Appendix A, will be completed. Once done, a copy will be provided to the homeowner, with any findings and recommendations cited. As appropriate, sample results, as may be required by the Mass DEP and/or the local Board of Health (BoH), will also be shared with the homeowner. As appropriate, copies will also be shared with the Mass DEP, the local BoH and/or other appropriate stakeholders.

Year 1

Monthly inspections during the first 6 months of operation.

Bi-monthly inspections (1 every 2 months) for the remaining 6 months of operation.

Years 2 and 3

Quarterly inspections (1 every 3 months)

Year 4 and Beyond

Semi-annual inspections (1 every 6 months)

All personnel conducting these site visits and inspections will have, or be directly supervised by someone having, a Mass DEP Grade 4 Wastewater Treatment Plant Operators Certification or higher.

NOTE: These site visits by local KleanTuSM personnel, or a licensed designee, are contingent on the respective homeowner having a contract in place for these visits and inspections.



Appendix A
NitROE® WWTS Tank Inspection and Sampling Checklist

Date: _____ Time: _____
Homeowner Name: _____ Location: _____
By: _____ Signature: _____
Sample ID: _____ Sample Date: _____

I. Field Measurements (In-Situ or From Collected Sample)

Table with 4 columns: Item, NitROE® Tank Influent (I), NitROE® Tank Middle Trough (MT), NitROE® Tank Final Effluent (E). Rows include Water Depth (ft), pH (su), Temperature (°C), Dissolved Oxygen (mg/l), Conductivity (umho/cm), Sludge Depth via sludge judge (ft), Suspended Solids Present (visual), Color, Turbidity (NTU), and Odor.

NOTES: _____



IV. Findings

V. Recommendations
