



ADVANCED ONSITE SOLUTIONS LLC

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THE CLEAN SOLUTION™

Alternative Wastewater Treatment System

Advanced Onsite Solutions LLC (AOS) would like to thank you for your interest in ***THE CLEAN SOLUTION™*** alternative wastewater treatment system. AOS distributes ***THE CLEAN SOLUTION*** system in New Hampshire, Vermont, Maine and Massachusetts.

THE CLEAN SOLUTION is an affordable, ecologically sound alternative wastewater treatment system that replaces the conventional leach field currently required with septic systems. ***THE CLEAN SOLUTION*** accomplishes the biological functions of a leach field in a subterranean tank the size of a septic tank, discharging a treated effluent cleaner than typical treated municipal sewage. ***THE CLEAN SOLUTION*** installations range in capacity from single-family homes and vacation cottages to large community systems and commercial applications. ***THE CLEAN SOLUTION*** has earned a reputation as an environmentally friendly, cost effective, low-maintenance alternative subsurface disposal system.

The information in this booklet is designed to give you a clear understanding of the system, as well as to outline the respective responsibilities of the Home Owner, Designer, and the Installer. Information is updated as necessary to address technological advances or regulatory updates pertaining to the system approval process. To ensure that you have the most current information please contact AOS at 1-866-900-2415.

There are four critical steps to follow when using ***THE CLEAN SOLUTION*** system.

1. The owner must hire a Designer licensed in the state where the system will be installed. ***THE CLEAN SOLUTION*** system must be designed, installed and operated as described in the Innovative/Alternative System approval granted by that state's Department of Environmental Services.
2. Prior to application for state or local approval, a copy of the design plan(s) and supporting documentation must be submitted to AOS for review and approval. This is required to ensure the homeowner(s) has been provided with the required documentation outlining the Sales and Maintenance of the system.
3. In conjunction with the Installer, AOS requires that a certified AOS technician install the components of ***THE CLEAN SOLUTION*** system.
4. The owner of a property where ***THE CLEAN SOLUTION*** system has been installed shall have a valid maintenance contract with AOS or an approved vendor. The minimum length of any contract shall be for a period of two years.



CONVENTIONAL SUBSURFACE DISPOSAL SYSTEMS

vs.

THE CLEAN SOLUTION

In a subsurface disposal system there are basically two processes that break down and treat wastewater. The first process is Anaerobic (without oxygen) in the septic tank, and the second process is Aerobic (with oxygen), which often occurs in the leach field of a conventional subsurface disposal system.

Function of a Septic Tank

The first component of the subsurface disposal system is the septic tank. The septic tank inlet receives black and gray water from the structure (i.e. house) and allows solids to settle out while lighter matter – like oil and grease – rises to the top. The septic tank is the anaerobic component of a conventional subsurface disposal system, allowing the biological process of breaking down solids into dissolved solids - a necessary step for final aerobic treatment. The septic tank then outlets effluent that has gone through the anaerobic process to a leach field.

Function of a Leach Field

Since an anaerobic septic tank provides only partial treatment, further aerobic activity is required for complete treatment. The leach field is the component of the subsurface disposal system that provides this aerobic treatment. There are three major types of leach fields currently being used; Pipe and Stone systems, Chamber Systems, and Fabric Based Systems. All three types require airflow through the system to begin the aerobic treatment process. Air is introduced into the leach field either by airflow through the soil or by adding vents. Aerobic treatment creates a biomat /clogging layer (sludge) within the leach field. The biomat is a biological growth which filters out solid particles and dissolved pollutants not processed within the septic tank. As the biomat forms, a clogging layer forms on the soil interface between the stone and the sand blanket. On fabric based systems the clogging layer forms on the fabric as well as the soil interface between the fabric material and soil surface. The development of biomat /clogging layer is a function of the organic loading as well as the loading rate (gallons per day). High strength effluent from restaurants is typically 5 to 10 times stronger than residential effluent and will result in the biomat / clogging layer forming at a faster rate. As the biomat / clogging layer becomes thicker the infiltration rate of the system decreases. As the infiltration rate decreases over time the leach field becomes overloaded (flooded). Once overloaded, the leach field converts from aerobic treatment to anaerobic treatment. At this point the leach field no longer is able to effectively treat the wastewater, which results in polluting groundwater and nearby surface water. Onsite septic systems are a major concern for property owners in sensitive environmental areas.

Function of *THE CLEAN SOLUTION*

THE CLEAN SOLUTION utilizes a septic tank to perform the same function as the septic tank in a conventional subsurface disposal system. ***THE CLEAN SOLUTION*** system differs from a conventional septic system, however, in that the aerobic treatment process occurs within the BioCon™ chamber, instead of in a leach field.



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In the BioCon chamber, air is introduced into the effluent stream. The air (oxygen) and effluent stream (food) then prompts the growth of a biofilm (bacteria) on the media stored in the BioCon chamber. The biofilm breaks down the wastewater, reducing BOD₅ and TSS levels, as well as nitrogen and phosphorus. The biofilm in the BioCon chamber is equivalent to the biomat in the leach field, creating sludge as a byproduct of the treatment process. The treated effluent from the BioCon chamber then flows into a settling chamber. The settling chamber allows excess sludge to settle out of the effluent.

From the settling chamber, clear treated effluent is dispersed into the ground through a dispersal field. The advantage of **THE CLEAN SOLUTION** system is the "Biomat" has been trapped in the settling chamber and is pumped out when the septic tank is serviced. **THE CLEAN SOLUTION** system has provided the aerobic treatment, allowing clear treated effluent to be dispersed into the ground in a much smaller area called a "dispersal field". Because of **THE CLEAN SOLUTION** treatment process, the dispersal field does not suffer the same clogging fate as a conventional leach field. The size of the dispersal field varies from State to State and is typically set by a State's Environmental Department. Call AOS for the appropriate sizing information of the dispersal field.

With a conventional soil based septic system, homeowners are not typically aware of problems lurking in the leach field below the lawn. Owners only become aware that the leach field has reached its effective life span - when the sewer line backs up into the house or the lawn becomes too "soggy" to mow. Remote leach fields go years in failure without anyone noticing the problem. Long before the "soggy" areas are noticed or the sewer backs up into the house, untreated wastewater has entered the groundwater and nearby surface water. When the homeowner reaches the "soggy" lawn point the system needs to be replaced, which is very costly and disruptive. Often the replacement of the leach field results in a major impact to the property's existing landscaping.

With **THE CLEAN SOLUTION**, the system is typically inspected when the septic tank is serviced. The technician inspecting the system is trained in its proper operation and determines if the system is functioning properly. If a problem is encountered, it can often be corrected during the inspection process and long before the "soggy lawn" symptom occurs.

When to Use **THE CLEAN SOLUTION**

THE CLEAN SOLUTION system is well suited for use in any septic system application where the installation of a standard leach field would be expensive or difficult – whether it's a single-family house, multi unit development, or a commercial development. Examples include homes on bodies of water, high water tables, ledge, small lots, housing developments, condo units, restaurants, shopping centers and office complexes. **THE CLEAN SOLUTION** unit is an affordable, completely in-ground system that is ideal for all new installations or failed system replacements.



ADVANTAGES OF USING *THE CLEAN SOLUTION*

Environmentally Friendly

- **THE CLEAN SOLUTION** system, a tank that is installed in line after the septic tank, provides the same aerobic treatment that a leach field is designed to provide. As a result, a smaller field is required to disperse the treated effluent into the ground.
- **THE CLEAN SOLUTION** system helps prevent ground water pollution and protects our natural streams, lakes and wetlands.
- Adaptable for sensitive sites.
- Tests show that **THE CLEAN SOLUTION** is more environmentally safe.
- Recharges groundwater with a higher level of treatment than conventional systems.

User Friendly

- Accommodates vacations, low flows and peak loads.
- Landscape friendly - tanks in ground, no raised covers above ground.
- Low operating cost.
- Does not require a pump for gravity systems.
- Reduces costly repairs in the future.

Low Maintenance

- In residential applications, pumping required only every 2 to 3 years depending upon use.
- There are no mechanical or electrical components within the BioCon treatment chamber.
- **Does not require remote operating via phone modem to maintain treatment.**

Technical and Installation Support

- AOS provides one-on-one support throughout the design, installation and startup process.
- AOS staff has experience in designing all types of subsurface disposal systems.
- AOS has on-staff Licensed Designers, Installers, Certified Septic System Evaluators and Wetland Scientists trained in wastewater sampling.
- AOS staff has been involved in onsite wastewater disposal system designs since 1986.
- AOS can provide you value engineering services on projects for cost comparisons.

Community Developments

- Grouping homes together to utilize larger **CLEAN SOLUTION** systems, in conjunction with the smaller dispersal field, can substantially reduce cost. The larger systems also permit better land use and can result in maximizing the number of units allowed on a piece of land.

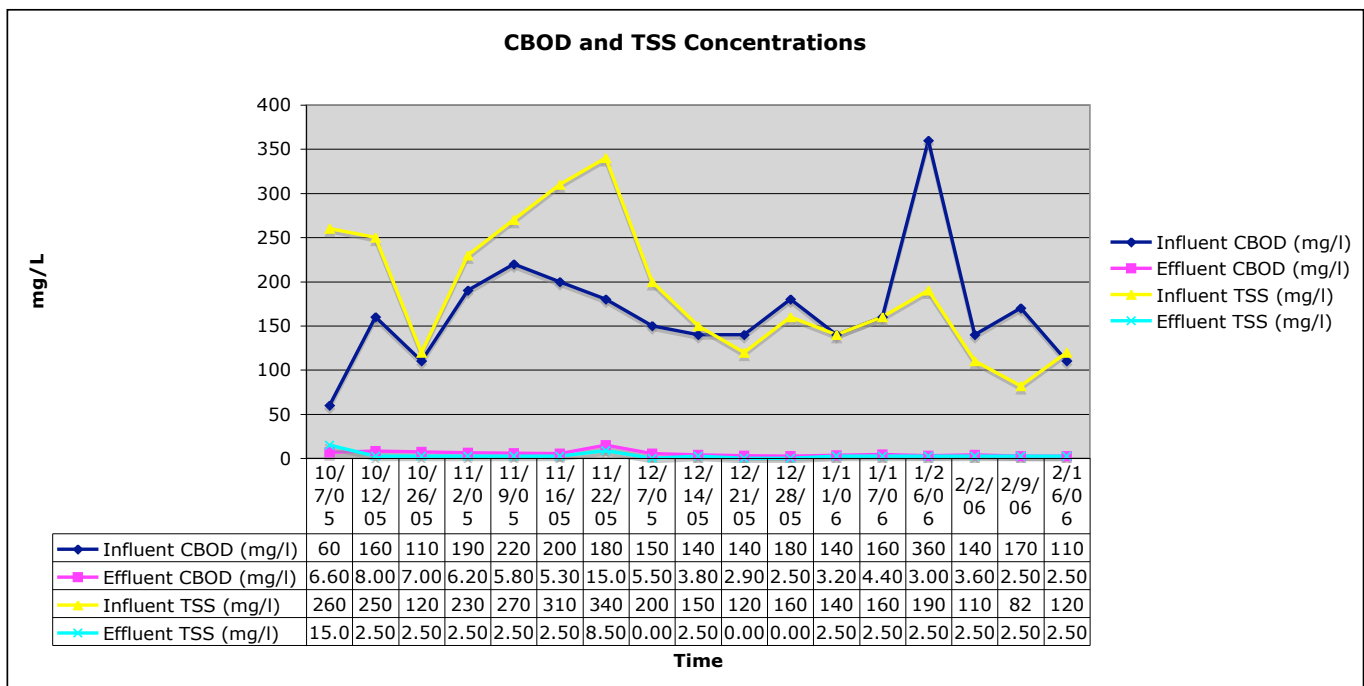
Restaurants

- **THE CLEAN SOLUTION** system can be used to treat high strength wastewater.
- Improves efficiency of the subsurface disposal system dispersal field.
- Reduces costly repairs in the future.



INDEPENDENT TEST RESULTS

In addition to the creativity and flexibility that it gives designers to fit systems into a natural setting while reducing impact to natural buffers, *THE CLEAN SOLUTION* reduces BOD₅ and TSS below 30 mg/l, and in most residential projects the results are in the single digits. The system has been tested at the Massachusetts Alternative Septic Testing Center located at Otis Air National Guard Base on Cape Cod. A measured 550 gal/day from the base facilities are metered into the system each day. Test results average 5.2 mg/l BOD₅, 3.1 mg/l TSS, levels far superior to municipal plants, typically operating at 30mg/l for both BOD and TSS.



It is important to note the difference between the influent and effluent CBOD, which is a measure of the strength of the wastewater. The influent test BOD is very typical of that from the septic tank in a residential dwelling.

High strength wastewater from a restaurant typically has BOD and TSS levels four to ten times higher than residential wastewater. In wastewater sampling completed by AOS, we have seen wastewater strength as high as 4900 mg/l for BOD, 4000 mg/l for TSS and FOG (Fats-oil-grease) at 930 mg/l. Conventional leach field sizing is based on residential strength wastewater. The organic loading on a conventional soil or fabric based leach field from high strength wastewater increases the rate that the Biomat forms resulting in early failures. *THE CLEAN SOLUTION* system reduces high strength wastewater down to levels typical of treated residential wastewater.



WHY USE *THE CLEAN SOLUTION* SYSTEM

Cost Effective – Reduced Field Size

- With the increased cost of materials and the difficulty of obtaining quality septic sand and washed stone, designers, installers and developers are seeing *THE CLEAN SOLUTION* system as the best alternative. With a dispersal area 50 to 90% smaller than a conventional field, money is saved on land clearing, grubbing, transporting fill material, and labor to construct a leach field that meets the State's square foot requirements. These savings offset the cost of *THE CLEAN SOLUTION* system, often reducing the overall cost of the septic system to the homeowner.

Use Any Field Design

- *THE CLEAN SOLUTION* dispersal field can be constructed using any of the approved field technologies, both proprietary and conventional pipe and stone.

Environmentally Friendly

- Local and State Land Use Boards are becoming more aware and concerned with the impacts that developments have on our natural resources, including groundwater and sensitive areas. *THE CLEAN SOLUTION* system produces an effluent quality well above what is considered the acceptable standard, while reducing the overall landscape impacts.
- With a dispersal field smaller than a conventional field, designers, engineers, and site evaluators have increased options for a design that fits into the natural settings of each lot. The reduced size allows the designer to keep trees, rocks and other natural features undisturbed.

Developments

- In a cluster development, *THE CLEAN SOLUTION* can reduce the overall project cost by connecting multiple homes to one system. To maximize the cost efficiency, the engineer must weigh the costs of the additional infrastructure required for effluent collection with the savings from using a larger *CLEAN SOLUTION* system to determine the appropriate size of each clustered system.
- *THE CLEAN SOLUTION* is also very effective in new developments where land costs are high. Minimizing the area needed for the leach field may result in the creation of additional building sites.

THE CLEAN SOLUTION system is the best alternative when proposing a new development where land costs are high and minimizing the area needed for leach fields may result in additional building sites. It is equally effective in environmentally sensitive areas such as wetlands and water bodies. *THE CLEAN SOLUTION* will help to offset rising field and land costs. The entire AOS staff has experience in all phases of development from conceptual layout through permitting and construction. Please call and have one of our staff members work with you to see how your client can benefit from using *THE CLEAN SOLUTION* system.



RESPONSIBILITIES

The responsibilities for a **CLEAN SOLUTION** installation rest in the partnership between the owner, designer, installer, and AOS. Below is an outline of responsibilities.

The Owner

1. Retains a Licensed Designer to prepare a plan.
2. Reviews plans prepared by Licensed Designer.
3. Reads the conditions outlined in the AOS's *Sales and Maintenance Agreement*.
4. Obtains all necessary permits and approvals required at both the State and Local levels.
5. Executes a sales agreement with AOS at least 3 weeks prior to installation.
6. Executes an Inspection / Maintenance Agreement with AOS.
7. Hires a contractor to install the septic tank(s), pump chamber, pump components and complete all earthwork.
8. Owner and AOS Technician determine location of compressor.
9. Hires a licensed electrician for all required electrical work.
10. Retains Licensed Installer to complete construction.

The Licensed Designer

1. Provides owner with a copy of AOS's *Sales and Maintenance Agreement*.
2. Explains to the owner the difference between **THE CLEAN SOLUTION** system and a conventional wastewater disposal system.
3. Completes all fieldwork required by the State to obtain the necessary construction approvals.
4. Prepares design plans.
5. Contacts AOS to discuss system design parameters.
6. Reviews final design plan with owner for owner sign-off.
7. Provides AOS with a copy of the design plan(s) and supporting documentation for final review and AOS files.
8. If a pump is required for single-family residence, designer to provide contractor with pump operating parameters (gpm, TDH, diameter of discharge line and volume of dose) .
9. Submits final design for local approval if applicable to the State Agency
10. Provides plans "Approved for Construction" to homeowner and homeowner's licensed installer.

Advanced Onsite Solutions

1. Reviews system design parameters with Designer.
2. Prepares standard *Sales and Maintenance* agreement for Owner with system design schematic.
3. Provides Contractor with Purchase Order for tanks provided by AOS outlined in Sales agreement as part of contract price.
4. Coordinates project schedule with Contractor for installation.



5. AOS Technician to install the following components onsite;
 - a. BioCon Media
 - b. Air transfer system
 - c. Setup Air Compressor
 - d. Internal BioCon plumbing
6. Installation checklist with swing ties to access stacks, with copy of report to Owner.
7. Once the system has been installed and approved for use, AOS to review system, operation and maintenance schedule with Owner.

The Installer

1. Contracts with owner for all work outside of AOS's responsibilities.
2. Contacts AOS at least 3 weeks prior to installation to plan installation schedules.
3. Provides all subsurface system components and materials outside of AOS's responsibilities. See Sales Agreement and system schematics.
4. Excavates for the septic tank and all AOS tanks to design elevations as shown on approved construction plans.
5. Calls AOS tank supplier with Purchase Order Number to arrange delivery and setting of the AOS tank(s).
6. Constructs the dispersal field in accordance with the approved design.
7. Installs all piping to and from all tanks.
8. Installs the piping from **THE CLEAN SOLUTION** system or pump chamber to dispersal field.
9. **Seals all pipe penetrations and knockouts with a watertight non-shrink mortar.**
10. Digs necessary trenches for the electrical conduits and airlines.
11. **Brings risers to grade. Contractor ensures that all sections of risers are watertight.**
12. Completes all leakage tests if required by designer.
13. Backfills system components, loam, seed and mulch disturbed areas as required by approved design plans.
14. Calls the regional inspector and local inspector when applicable.
15. Obtains Operations Approval for system and provides it to homeowner when applicable.

The above list of responsibilities is a general outline. Additional responsibilities may be required based on specific site conditions or type of use. AOS is not responsible for work completed by the designer or installer. It is the owners(s) responsibility to contract directly with designer and installer.



MAINTENANCE and OPERATION FOR SINGLE FAMILY RESIDENTIAL SYSTEMS

The following maintenance is required. It is the owner's responsibility to see that this maintenance is performed. The owner must maintain a Maintenance Agreement with Advanced Onsite Solutions or an approved vendor.

Residential Use (Single Family Home)

1. If the ISDS (Individual Subsurface Disposal System) is a gravity system **THE CLEAN SOLUTION** system shall be inspected every 2 years by a certified AOS Technician.
2. If the ISDS is utilizing the settling chamber as a pump chamber AOS recommends that **THE CLEAN SOLUTION** system be inspected yearly by a certified AOS Technician.
3. A certified AOS may adjust the above inspection frequency based on use. Seasonal uses will be modified (based on use) after first inspection.
4. Use a local pumper to pump out the septic and settling/pump tanks every 2-years. More or less frequent pumping may be required depending on system use and number of occupants. AOS and the pumper can determine the required frequency. Owner must retain records of pumping.
5. Compressor must run continuously. It should be checked for operation at least once a month.
6. BioCon™ chamber may require pumping between 6 and 8 years. AOS Technician will determine if pumping is necessary during inspection.
7. Compressor Air Filter to be cleaned or replaced yearly.
8. Compressor may be disconnected during the off-season for seasonal uses (less than 6 months)

Additional Maintenance Suggestions:

There is an ongoing concern with pharmaceuticals, medical treatments, and personal care products and how these products affect septic system functions. Although there is not yet enough data to clearly understand the impacts of these products on septic systems, it is known that without the proper balance of bacteria in the septic tank, waste cannot break down as efficiently. AOS recommends that unused pharmaceuticals not be disposed of in the septic system.

Maintenance Contracts are available from AOS. The service will include a detailed inspection of the system and replacement of any failed items within the BioCon Chamber. Tank pumping is not included in the price and must be arranged by the property owner. Failure to have a maintenance agreement with AOS or an approved vendor will void maintenance warranty outlined in the **Sales Agreement**.

MAINTENANCE AND OPERATION AGREEMENTS ARE FURTHER DETAILED IN THE SALES AGREEMENT BASED ON INDIVIDUAL STATE REQUIREMENTS.

Contact AOS for Maintenance, Operational and Warranty requirements for all commercial projects.



THEORY of *THE CLEAN SOLUTION*TM

In conventional decentralized septic systems - whether used for individual homes, commercial applications or a community septic system - a septic tank(s) is used to first provide anaerobic (without air) treatment of the waste. This is followed by a leach field to provide aerobic (with air) treatment of the effluent.

Septic tanks work well for capturing and digesting the solids, which are anaerobically fermented over a long period of time, dissolving the solids into liquid waste. However, a septic tank is not designed to treat the contaminants that dissolve in the liquids. These are treated aerobically in the leach field. Municipal systems, which handle very large volumes of wastewater, use different equipment to accomplish the same biological functions as a septic system: primary sedimentation tanks remove solids, and a subsequent aerobic system treats the contaminants dissolved in the liquids. Settled solids are removed from municipal primary and secondary facilities for further treatment.

Every aerobic treatment system, whether a conventional leach field, municipal treatment plant, or ***THE CLEAN SOLUTION***, depends on bacteria to treat the effluent from a solids settling system. In order for the bacteria to reproduce, they require energy (food) and air. By using the contaminants in the effluent as food and atmospheric air, the bacteria metabolize the dissolved solids to carbon dioxide, water, and sludge (colonies of bacteria). The aerobic bacteria also convert ammonia compounds to nitrates.

A large number of bacteria need to come in contact with the food source in order to purify an effluent. Treatment systems utilize different methods to provide the necessary bacteria population. A municipal system mechanically stirs up the bacteria in the secondary treatment process so that they will contact their food and not settle out of the effluent. In a leach field, the sludge (biomat) that forms at the ground interface is a large colony of bacteria through which the dissolved solid stream flows. In ***THE CLEAN SOLUTION*** the bacteria collect in a thin film on the plastic media in the BioCon chamber, and the effluent circulates through the plastic media.

THE CLEAN SOLUTION uses the same biological process as a municipal secondary treatment plant, utilizing the activated sludge process. Solids are settled out and air is added for bacteria respiration in the BioCon. This allows the bacteria to convert the carbonaceous dissolved solids to carbon dioxide, water, and sludge. In addition, the urea and ammonia converts to nitrates and sludge. The sludge created is settled for periodic removal from the system, and a clean, odorless effluent is discharged to the dispersal field.

The major difference between a conventional septic system and ***THE CLEAN SOLUTION*** is where the bacteria (sludge) collect. In a conventional system, the sludge forms in the bottom of the leach field and restricts the effluent flow enough so that the bacteria has time to act. This flow rate through the sludge determines the required field size. In ***THE CLEAN SOLUTION*** system the sludge is formed in the BioCon chamber, resulting in treated, clear effluent discharging to the dispersal field. This field can be greatly reduced in size because there is no further treatment required to reduce BOD and TSS.



FREQUENTLY-ASKED QUESTIONS ABOUT *THE CLEAN SOLUTION*

Does the system need a real leach field?

The dispersal field is constructed the same as a conventional field, the only difference is the size. Since ***THE CLEAN SOLUTION*** BioCon and settling chambers perform the same biological functions as a leach field there is no need to have a large leach field to provide aerobic treatment.

Can I use other proprietary devices in place of a pipe and stone field?

Yes. Any approved stone and pipe replacement system is acceptable, however, there are some that would not prove cost effective, but are still compatible with ***THE CLEAN SOLUTION*** system.

How do you size chambers or tubes?

The tubes are sized based on the field print conversion using the total footprint of the field and then judging how many tubes or chambers would be used for that space.

How do you vent the field of *The Clean Solution*?

Typically, ***THE CLEAN SOLUTION*** is vented through the house's existing roof vent. Therefore, a field vent is unnecessary. When using the system on an application without a roof vent, a vent must be installed at or near the tank (i.e. a trailer park or campground must be vented at the tank). Certain proprietary leachfield devices require venting.

Are there any additives in the system?

No, the only thing that ***THE CLEAN SOLUTION*** system needs to run is air, which comes from the small mechanical air compressor.

Where does the air compressor go?

The air compressor can go anywhere above the snow line, but the most ideal place for it is in a garage or basement.

How much noise does the air compressor make?

The air compressor makes less noise than a refrigerator.

How much electricity does the air compressor require to run?

The air compressor requires approximately 80 watts and 1 amp, which can be thought of as the power required for a typical light bulb.

How often do I need to maintain the system?

The system maintenance is done at the same time the septic tank is pumped.

What does the system inspection consist of?

AN AOS-trained technician or vendor inspects the media, effluent quality, dissolved O₂ levels, settling chamber, performs a compression test on the air transfer system, and cleans or replaces the air filter.



FREQUENTLY ASKED QUESTIONS (continued)

What if I need to order replacement parts?

Contact AOS for replacement parts. We will also handle any maintenance or repairs.

Is the system exempt from certain setback rules or to ground water tables?

THE CLEAN SOLUTION system has received variances to State regulations on replacement systems. Variances would be applied for by the designer.

Do I need an effluent pump?

An effluent pump is only needed if the dispersal field is higher than the outlet of the tank.

Please call AOS to discuss your specific project needs and information for *THE CLEAN SOLUTION* system model that best fits your needs.