Operation and Maintenance Guidelines For Decentralized Wastewater Treatment Systems

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American Decentralized Wastewater Association

As A Service to the Decentralized Wastewater Industry

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PREFACE

The intent of the American Decentralized Wastewater Association (ADWA) in preparing these Operation and Maintenance Guidelines for Decentralized Wastewater Treatment Systems is to provide state regulatory agencies with information on the role that onsite and decentralized systems have in protecting public health and the environment and the necessity for a well managed operation and maintenance program. These guidelines define the responsibilities of the various participants, the training requirements, and maintenance management responsibilities.

ADWA represents manufacturers of advanced treatment systems. ADWA promotes a strong regulatory program in the areas of performance certification for people and treatment components as well as enforced operational maintenance requirements for all installed systems. Both program areas are important for the protection of the human and natural environments and the reputation of the decentralized wastewater treatment industry.

These guidelines can provide regulatory agencies with a broad outline of the responsibilities of the various parties and the tasks associated with implementing a program. Regulatory agencies will recognize that all of these issues should be addressed and resolved when establishing onsite and decentralized programs.

INTRODUCTION

USEPA states that nearly one in four households in the United States depends on individual onsite systems or cluster systems (decentralized) to treat wastewater. When these systems are adequately managed they are cost-effective and offer a long-term option for meeting public health and water quality goals. In some cases, these systems were installed and then largely forgotten until problems arose. A disconnect between end-user awareness, mandated routine service outside the initial warranty period and a well-defined enforcement policy are potential causes for premature system failures. To assure the long-term use of these onsite systems, the industry needs comprehensive, system specific operation and maintenance (O&M) guidelines that are cost effective and sustainable.

Historically, after systems were installed, the absence of regular operational inspections and performance monitoring was a major shortcoming in implementation of decentralized onsite wastewater programs. Since all onsite systems, whether passive or advanced, require program management, all systems should be inspected when installed and over the long-term.

ADWA believes that a well-defined O&M program should encompass:

- Receiving environments,
- Potential risks posed to public health and water resources,
- Comprehensive, long-term maintenance,

- Homeowner awareness, and
- Regulatory enforcement.

The objective of this document is to provide background information on the importance of the various aspects of operation and maintenance, from training through enforcement. To ensure adequate management of decentralized wastewater treatment systems, state and local governments can use this background information to develop programs to ensure the long-term, sustainable operation of onsite and decentralized systems.

THE ROLE OF ONSITE AND DECENTRALIZED SYSTEMS

Onsite systems are the only alternative available for a major percentage of the population, while the failure to maintain these systems can result in a threat to public health and the environment. The systems offer a cost effective alternative to a central sewer system especially in low population density areas. The scope of the O&M program should be established by characterizing and minimizing the potential risk that system failure poses to health and water resources.

In 1997, USEPA's "Response to Congress on Use of Decentralized Wastewater Treatment System" concluded that decentralized systems can protect public health and the environment, have lower capital and maintenance costs for rural communities, are appropriate for varying site conditions, and when adequately managed, are suitable for ecologically sensitive areas. EPA specified several major barriers that existed to the use of these systems, including:

- Lack of awareness about system maintenance requirements, and public misperception regarding system performance and capability,
- Public misperception regarding system performance and capability,
- Regulatory and legal constraints,
- Lack of management,
- Fear of liability; financial disincentive for designers, and
- Financial constraints.

Properly sited, designed, installed and managed decentralized systems provide for recycling and reuse of treated wastewater for groundwater recharge, replenishment of aquifers and protection of ground and surface water. Decentralized systems offer cost effective options for communities, particularly in those communities that are less densely populated.

Onsite systems can include advanced treatment for nitrogen reduction, phosphorous removal and disinfection. Wastewater influent to these systems is variable and can contribute to treatment upsets. These complex systems require a more comprehensive inspection and maintenance program because of advanced mechanical and electrical components and varying influent parameters. Only by implementing an O&M program, can the regulating community protect the investment in these advanced treatment systems and assure that these systems also operate to protect the public health and environment.

OPERATION AND MAINTENANCE OF DECENTRALIZED SYSTEMS

All onsite systems whether septic tank or advanced treatment, require operation and maintenance. Without an ongoing O&M program, it is not possible to make certain that systems perform for the long-term as designed. On going service contracts, which include inspections and/or monitoring, can document system performance. The information that is collected may eventually provide documentation to evaluate wastewater impacts on regional surface water and groundwater quality.

A well documented O&M program can make available the necessary information for property title transfer. Many states and jurisdictions now require inspection of onsite systems prior to real estate transfers. An O&M program that includes inspection documentation should reduce or eliminate the costs associated with property transfer investigations.

USEPA states that four factors will affect the frequency of regular maintenance:

- Regulations,
- Site conditions and population density,
- Technology, and
- Wastewater source or use.

Regulators should implement O&M programs based on the above factors.

RESPONSIBILITIES

All parties have a responsibility for implementing and conducting an O&M program that ensures continued operation of the onsite systems. The following sections describe the participants and their responsibilities.

Service Providers Responsibilities

Licensed service providers, trained and certified by the manufacturer, are integral to any O&M program. A comprehensive onsite management program will include regular inspections of all systems. These trained professionals are responsible for ensuring that the system operates efficiently and meets effluent limits. As with municipal treatment, only trained personnel can be expected to understand and implement the product specific operation and maintenance requirements of advanced treatment systems.

Field Inspections

Field inspection is essential for all systems to ensure that the system is operating, and has not been damaged due to improper disposal of cleaners, paints or oil and greases, etc. Septic tank and leaching field gravity systems, when simply treating the normal inputs

from residential wastes, require O&M inspections for cleaning effluent filters, periodic tank pumping and visual evaluation of the leaching field.

Advanced treatment technologies require a more comprehensive O&M program. Service providers are required to check mechanical components, measure and manage sludge levels, check / clean effluent filters, monitor effluent quality, and where required, monitor and adjust the treatment process. Secondary disinfection devices and effluent dispersal equipment also need to be evaluated to ensure the entire system is operating as designed.

Procedures and Protocols

To assure consistency and accuracy, the service provider should follow a defined set of procedures and protocols. Many OEMs have developed procedures and protocols for field inspection and any sampling or field-testing that may be necessary for their technology. The O&M manual supplied with the equipment should include the detailed set of inspection procedures that the service technician is required to conduct during each visit. Appendix B contains such a typical protocol.

The O&M manual should include a detailed checklist. All equipment requiring inspection should be included in the checklist. The service provider is responsible for accurate completion of this checklist. It then becomes a permanent record for inspection and maintenance.

Field sampling of onsite treatment systems should be conducted only under controlled conditions using a known, representative flow pattern, a properly designed sampling port, and when necessary a flow-proportional composite sampler. Composite samples, while more costly to collect then grab samples, are the preferred method to determine the efficiency of these systems. All sampling and analysis should be analyzed in accordance with Standard Methods. Sampling should only be conducted after a sufficient time is given for the system to reach steady state conditions.

OEM Responsibilities

An OEM trained group of professional service providers is required to ensure the long-term viability of their specific system. The OEM has a responsibility to train a sufficient number of service providers. Training courses should be accessible and readily available. In those jurisdictions where a trained service provider is required, it is the responsibility of the OEM or their local distributor to ensure that their contract includes such a professional. The OEM should also include a two-year O&M contract with bi-annual service visits in the initial price of the unit, per NSF requirements.

OEMs should develop training programs that cover the following:

- Frequency of service visits,
- Protocols for those visits,
- Detailed checklists and procedures,

- Maintenance parts service life, and
- Maintenance activities outside the scope of the contract.

All OEMs should stress that owners hire only operators that are educated in maintaining the supplier's systems to make sure that the providers are up-to-date on the latest technologies. OEMs must provide materials that educate owners on proper maintenance necessary to protect the integrity of this major investment. They should equate the onsite treatment unit to other major appliances and create owner awareness that system failure could affect public health and the environment.

The OEM is responsible for providing the potential owner with a list of responsibilities before the system is sold or installed. Basic O&M educational materials and service reminders should be circulated to system owners. The OEM has a responsibility to ensure that the owners understand the limitations of equipment, the wastewater characteristics that the system is designed to handle, and the consequences if the wastewater characteristics are outside the design parameters. The OEM should also make certain that the system owner understands that the treatment unit is only one portion of the entire onsite system.

The OEM should provide a comprehensive and readable O&M manual that can be easily, understood by system owners. The manual should contain at a minimum:

- Detailed description of the unit,
- Comprehensive description of the maintenance requirements,
- Recommended schedule for inspection and maintenance,
- List of prohibited substances and their impact on the system (see Appendix A),
- Checklist for inspection and maintenance, and
- Recommendations on retaining qualified service providers.

Government Responsibilities

Regulators recognize that failure of onsite systems can contaminate ground or surface water, and can have an impact on public health. In certain cases drinking water contamination can also occur. Regulators should develop onsite treatment regulations in response to these threats.

State or local regulators should receive the following from the regulations:

- Authority to enter private property for inspection or health nuisance abatement.
- Authority to require repair or replacement of malfunctioning systems.
- Authority that allows private entities to manage systems, charge fees, or apply for funding.
- Site evaluation procedures.
- Requirements for education and training for service providers.
- A well-defined permitting process.

- Oversight of design.
- Oversight of installation/construction.
- Minimum operation and maintenance requirements.
- Oversight over operating permits based on completion of required O&M tasks and inspections.
- A procedure for inspection, complaint, and compliance assurance.
- Program funding, including fees for permitting, inspection, or other management activities.

Regulators have a responsibility to ensure that service providers are trained in the basics of onsite wastewater and to service the various technologies. By including a training requirement in the technology approval process, the regulator assures that trained service providers will be available. The regulator should also specify minimum educational requirements.

The regulator assists in improving the reputation of all onsite systems by requiring long-term maintenance. Gravity flow soil-infiltration systems with only a septic tank and distribution box require basic O&M skills such as educating owners to limit inputs to normal sanitary wastes, cleaning effluent tee filters, periodic tank inspection, sludge pumping and leaching field inspection. Advanced treatment technologies require O&M programs that confirm that the systems operate efficiently over the life of the equipment.

Regulators should insist that O&M programs include:

- Licensing/certification program for service providers,
- Mandatory continuing education,
- Minimum educational requirements,
- A detailed inspection program,
- Right-of-entry provisions to gain access for regulating,
- O&M with details and schedules as part of the system owner's approval,
- A reporting system that includes at least a basic database for program oversight by the regulators, and
- Requirements for groundwater and/or surface water monitoring.

Implementing this type of oversight also requires that the regulator develop an enforcement program. Several states that allow advanced treatment have not chosen to institute a requirement for or enforce long-term maintenance contracts. Unless there is enforcement, system owners will not seriously believe the regulations. The regulatory authorities must educate the regulated community and explain the long-term benefits of proper operation. Owners must be aware that proper maintenance of the onsite treatment system is critical to obtain the performance required by the approval. Since the onsite system is designed to protect the public health and the environment, enforcement of the regulations is an important part of any program. The type of enforcement program will vary depending on the authority that the regulators obtain from the regulations.

Regulatory agencies may develop a generic inspection form, which contains detailed information that is necessary for program management in addition to the technology specific checklists. Procedures and protocols alone, will not assure that field inspection is correctly performed. An inspection oversight program is also necessary. This oversight provides an independent evaluation of the fieldwork. An inspection form developed specifically for program management is essential in such an oversight program.

Any data collected in the field should be in a form that will allow regulatory personnel to develop a history of facility operations. Program managers should have the capability of tracking the performance of all facilities. This can easily be accomplished with a simple data base program. Inspection forms and checklists should be designed to collect the data necessary for appropriate tracking. As the number of systems increases, the volume of information generated could become so large that some type of electronic reporting may be beneficial.

ADWA believes that regulatory authorities have a responsibility to stipulate that onsite systems are serviced by trained, OEM certified service providers and that the approval process includes requirements for long-term O&M. The organization also asserts that advanced systems are designed to treat wastewater, but the units cannot be expected to provide the quality effluent required unless regulators require these basic things.

System Owner Responsibilities

The system owner has the responsibility for meeting the effluent requirements. The owner's state or local approval should include a requirement for hiring a trained service provider. To ensure compliance, enforcement requirements should be part of the approval.

Most system owners need educating on service requirements for onsite treatment systems. Since they are have little or no knowledge on the operation of these systems, they must be educated on proper maintenance, periodic service requirements and service contract development. The owner should understand that O&M programs could avoid contamination of the ground or surface waters, eliminate their need to monitor the system, and save them the cost of prematurely replacing an improperly maintained system.

Decentralized systems can include numerous residential or condominium developments, commercial buildings and retailers. When the system owner does not occupy the facility, they have a responsibility to educate their tenants in the use and abuse of onsite systems. It is only through an education program that explains the do's and don'ts that the onsite system performance can be maintained.

ADWA believes that much of the education can be conducted in conjunction with the OEMs' education program. By explaining that the long-term viability of the system depends on the user, many of whom may be unfamiliar with onsite systems, the OEM

educates that user about the resources that are available and where they can direct any questions.

Where many tenants are users of the system, the system owners may consider assessing the costs associated with operating the wastewater treatment system. A separate charge for these costs, based on the tenant's use, may be a method to assess the costs to the tenants with the highest impact on the system, specifically in office parks. This type of approach may not be practical in all cases but should be a considered alternative in order to educate the tenant on the impact of wastewater flow or characteristics on the treatment system.

USEPA in their Decentralized Manual states, "Proper maintenance of your wastewater treatment system is critical for its performance and important for you the owner. Your wastewater treatment system protects the health of the people living on and near your property; it helps safeguard your property values; and it helps preserve the environment."

The owner has complete responsibility regarding use of the onsite treatment system. The system owner is responsible for providing the OEM with as accurate a description of the design flow and wastewater characteristics, as possible. Inaccurate design to save money will contribute to failure of the onsite system. Owners must understand the complexities of the system and the fact that the advanced onsite systems are not a passive septic tank and leaching field.

TRAINING

An adequate training program that includes record keeping and reporting is integral to operation and maintenance. The following sections discuss the major training and record keeping issues.

Service Provider Training

Each technology supplier or original equipment manufacturer markets a unique treatment system. While many components of treatment are common to all systems, each technology has unique characteristics. Therefore, it is crucial that the OEM provides training before a service provider is allowed to maintain a system. In certain states, such as Massachusetts, all technology approvals have a section requiring the supplier to train the operators.

Training courses should be designed to cover a broad range of topics. They at minimum should provide the service provider with training on:

- Site visit protocol,
- Inspection and sampling procedures,
- Start-up procedure,
- Managing ongoing operation of the system, and
- Effective communication with both residential and commercial facility owners

The training course should be designed to improve the practitioner's ability to gather relevant information on a site, conduct inspection procedures in accordance with the requirements of the equipment, and prepare meaningful inspection reports. Training should include continuing education to ensure that service providers have up to date knowledge and skills for conducting onsite inspections and maintenance.

Distributor/Dealer Training

When the regulatory community requires training as part of the approval process, the OEM should require distributors and dealers to provide the training and education. A distributor training program should address the following elements:

- Supervising and training of internal staff,
- Annual training and continuing education courses, and
- Oversight to ensure the O&M is correctly implemented by staff.

A typical training course outline might include:

- Detailed discussion of the equipment and its operating characteristics including process description.
- Description of the nitrogen cycle where such treatment is employed.
- Initial startup procedures and what to look for including inspection and sample ports, equipment layout and venting.
- Communicating with home/business owners.
- Overview of prohibited substances, limited use substances, food waste, effluent characteristics.
- Service inspection requirements and procedures.
- Service checklist and its use including the detailed comments and information required to compete.
- Logbook requirements.
- Troubleshooting and using field observations and the service manual.
- Sampling and reporting requirements for the technology approvals.
- Technology specific sampling protocols.
- Overview of information that should be in a report.
- Logbook - Sampling notes.
- Test Results including sample analysis. What to do if you get laboratory results that do not meet the permit? How do you evaluate the laboratory results? How to compare the laboratory results against the field notes.
- Complaint response protocols.

Third Party Professional Training

Many states, the Consortium of Institutes for Decentralized Wastewater Treatment, the National Onsite Wastewater Recycling Association (NOWRA), and the National Environmental Health Association (NEHA) offer training and/or accreditation for onsite

wastewater treatment system inspectors. This type of training is excellent and should be required or at least encouraged.

Supplemental or continuing training and certification programs should be provided or supported by regulatory agencies through training centers or other means. The regulatory authorities, if given the responsibility, can require CEUs to ensure continued training. This may encourage third parties, such as operators associations and wastewater professional groups, to present continuing education programs. These types of programs help to create a professional group of service providers for onsite or decentralized programs.

Record Keeping/Reporting

As alternative systems are installed, the need arises for a procedure to determine how these systems are operating. Without a protocol and simple database storage for information on installed systems, it becomes laborious or infeasible to maintain program management. All jurisdictions should, at a minimum, develop a computer database to record and track decentralized systems.

Regulatory agencies in cooperation with OEMs should work together to develop and maintain a preferred solution for tracking all systems sold and installed in any jurisdiction. Collected information should be made available to regulatory authorities desiring to establish program management protocols. This approach should be expandable to allow input of inspection and maintenance information for all systems; eventually it might be used to monitor all systems for service and maintenance. Once in place electronic access for service providers could also be granted as an integral part of the overall management program. Internet-based data collection and storage is an example of a more comprehensive data base technology that can be employed to improve operator efficiency and performance tracking when large numbers of systems are involved.

Various electronic database or inventory control systems are being developed. EPA recently developed TWIST (The Wastewater Information System Tool) as a comprehensive MIS system with a Microsoft Access database for managing system information. The system accommodates a wide variety of queries, list reports and mapping applications if users provide relevant data. It is designed to help identify and capture important system inventory and service information, and to help standardize management information so data can be easily transferred to other systems.

NSF CERTIFICATION

NSF International is an independent, not-for-profit organization, which offers product testing and certification. The NSF Certification program for wastewater treatment units originated over thirty years ago.

The certification or product testing is generally only the first step of the process. Once conformance to the standard is demonstrated, including review and approval of the product literature, an initial inspection of the manufacturing facility is conducted. Following completion of the inspection, including any necessary corrective action, contracts for certification are issued. Inspection of the manufacturing facility is performed annually, and product retesting is performed if there are design changes significant enough to warrant it.

The NSF Mark symbolizes the only third-party certification of onsite treatment system products for the manufacturing industry and the regulatory community. NSF is also accredited by the American National Standards Institute (ANSI) to develop and publish American National Standards. The NSF wastewater treatment standards are developed primarily through a committee structure, with the NSF Joint Committee on Wastewater Technology at the core.

NSF operates the Water Quality Protection Center (WQPC) under the USEPA Environmental Technology Verification Program. USEPA established the Environmental Technology Verification (ETV) Program in 1995 to accelerate the implementation of environmental technology through objective verification and reporting of technology performance. The ETV Program develops testing protocols and verifies the performance of innovative technologies that have the potential to improve protection of human health and the environment. The WQPC evaluates the performance of treatment technology for residential wastewater in decentralized applications with the goal of accelerating the acceptance and use of improved and cost-effective technologies.

The NSF Joint Committee is comprised of representatives from the industry, public health and user communities. Each has approximately 12 seats on the committee. The process involves input from others, as provided through sub-committees, or task groups. However, the ultimate decision and voting rights reside with the joint committee. The standards against which NSF conducts onsite wastewater treatment system evaluations include:

- Standard 40 for residential wastewater treatment systems having rated capacities between 400 gallons and 1500 gallons per day. Any treatment technology can be evaluated during a six month (26 week) test where wastewater of required strength is subjected to the system at the rated capacity of the system at periods prescribed by the standard. Stress sequences are included to simulate wash-day, working parent, power outage, and vacation conditions.

- Standard 41 is for treatment systems that are not liquid saturated. These would include composting toilets and similar treatment technologies.

- Standard 46, relating to components of wastewater treatment systems, including performance evaluations for grinder pumps, septic tank effluent filters, chlorination devices, and UV disinfection devices.

- Standard 245, recently released, is for evaluating nitrogen reducing wastewater treatment technology.

In addition to the effluent performance, there are requirements for product literature, including installation, operation and maintenance, and trouble shooting and repair manuals. The system must meet minimum requirements for structural integrity, leakage, noise, electrical certification, access ports, failure sensing and signaling equipment (visual and audible alarms), flow design, data plate and service labels.

In order for residential wastewater treatment systems to obtain and maintain NSF/ANSI Standard 40 certification, the price of the product must include maintenance for the first two years. During this initial service contract, each piece of equipment must be serviced a minimum of two times per year, and emergency service must be available to the owner. Manufacturers must also offer the owner the option of renewing the service contract after the two years. For this reason among others, more manufacturers of onsite wastewater treatment systems and products are offering maintenance contracts with their products.

Service is generally provided by the dealer/distributor selling the technology, representing the manufacturer. Standard 40 specifies the type of service that is to be performed and the required record keeping. Both the manufacturers and dealers are inspected by NSF to ensure continued compliance with the Standard 40 requirements.

REMOTE MONITORING

As more and more decentralized onsite treatment systems are installed, remote monitoring can provide program managers and regulatory officials with verification of service and service providers with immediate notification of alarms. Remote monitoring can assist also the property owner to monitor and understand their system.

Remote monitoring, through dial up modem or direct internet connection, can reinforce basic O&M practices. It can supply the service provider, owner, and program manager or regulatory official with immediate knowledge of when and how a treatment system was serviced; the type of maintenance; when alarms have occurred and the response; a schedule of service; and a schedule of contract expirations.

An example of real time monitoring was displayed by USEPA's National Onsite Demonstration Project for Small Communities. The Conservation Funds' Freshwater Institute (Shepherdstown, WV) installed on-site wastewater treatment systems employing two different secondary treatment technologies. Real-time monitoring was part of the systems to:

- Display real time wastewater data on the Internet for use as an educational tool.
- Improve the understanding of innovative and alternative systems.
- Evaluate the feasibility of using remote monitoring in management districts with many small independent treatment systems.

- Investigate the maintenance requirements of specific probes; demonstrate how alternative measurement parameters correlate to conventional indicators for monitoring system performance.

USEPA states the benefits of remote monitoring include:

- Meeting the growing need for qualitative data,
- Sampling and translating real-time events to predict and prevent failures,
- Providing a rapid response to system recovery and operation, and
- Streamlining labor and other economic efficiencies.

Technology suppliers have developed remote monitoring hardware and software. These systems use integrated circuitry, advanced telemetry and/or web-based data acquisition for the remote monitoring of onsite treatment systems. The program is designed to operate the technology automatically; it also monitors the operation of the entire onsite system, provides verification of compliance with the installation permit and includes on-board diagnostics that verify when service work is performed and when maintenance is required. This type of system may be warranted in very sensitive areas.

These systems can provide detailed service reports and a complete operational history. System owners can have access to all information on file for their system. Regulatory officials and service providers can have access to data from each of the systems under their jurisdiction.

Remote monitoring technology can provide the regulatory agencies with a means to enforce a maintenance program. It can identify if a system has been visited on a regular basis. With the increasing number of advanced systems, it is vitally important that regular O&M occur, especially on larger commercial and condominium projects.

While the current technology cannot monitor influent or effluent parameters, such as BOD, TSS, etc., they can monitor pump on/off, flow and level. By integrating access for service providers, the systems can be used to allow those providers to enter operating parameters and information on treatment efficiency. All of this information can become part of a database that permits overall evaluation of the efficiency of all technologies. The information may eventually be integrated into area wide water quality models. Remote monitoring technology should be a tool, not an end, in evaluating operation of decentralized systems. Monitoring of onsite treatment systems can be utilized to demonstrate that the systems are being operated and maintained in compliance with the state or local standards.

MAINTENANCE MANAGEMENT

USEPA Published in 2003 Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems. The manual provides guidelines for upgrading the use of decentralized treatment systems. EPA's studies found that many of the decentralized systems in use are improperly managed and do not provide

the level of treatment necessary to adequately protect public health, surface and ground water quality. Decentralized systems are defined as managed individual onsite or clustered wastewater systems used to treat, and disperse wastewater from individual dwellings, businesses, or small communities or service areas.

Proper management involves implementation of a comprehensive, life-cycle series of elements and activities that address public education and participation, planning, performance, site evaluation, design, construction, operation and maintenance, residuals management, training and certification/licensing, inspections and monitoring, corrective actions, recordkeeping/inventorying/reporting, and financial assistance and funding. The performance and reliability of decentralized wastewater treatment systems can be improved through management programs. The Management Guidelines encourage institutionalizing the concept of management and raise the quality of state and local management programs.

ADWA believes that the benefits of properly managed decentralized systems include protection of water quality and public health, protection of owners' investment, increased service life for onsite systems and replacement cost savings, conservation of ground water by keeping it close to the source, and elimination of the need to use a community's tax base to finance sewers. Proper management is a comprehensive term for achieving the long-term sustainability of a system, including the adequate O&M of the system.

USEPA found that, although some management programs were effective, many existing state and local rules that regulate onsite systems were not adequate to ensure proper performance. Few systems received proper maintenance. Most regulatory programs do not require owner accountability for system performance after installation. Although USEPA found it difficult to measure and document specific cause-and-effect relationships between improperly managed onsite systems and the quality of our water resources, it is widely accepted that they contribute to major water quality problems. It is the absence of a comprehensive management program, which prevents onsite and decentralized systems from being considered an effective and reliable wastewater treatment strategy. Consequently, the potential for health and water quality problems from poorly managed systems is increasing.

USEPA's manual presents five management model conceptual approaches with progressively increasing management controls as sensitivity of the environment and/or treatment system complexity increases. The models are flexible so that programs can be customized by substituting elements of one program into another to accommodate local needs, practices, and conditions. The models are built around ensuring the accountability and competency of regulators and service providers using certification and continuing education, for owners through education and/or inspection requirements, and for third party managers through contract and permit stipulations. The "best" model program is not necessarily in the higher levels, but is the model that provides the most appropriate management controls for the risks. The five models are listed below; complete details of the models can be found in the USEPA manual:

- Management Model 1 - “Homeowner Awareness”
- Management Model 2 - “Maintenance Contracts”
- Management Model 3 - “Operating Permits”
- Management Model 4 - “Responsible Management Entity (RME) Operation and Maintenance”
- Management Model 5 - “RME Ownership”

Since the legal authority for regulating the systems generally rests with state, or local governments, those entities need to develop a flexible framework and guidance to tailor their programs to the needs of specific communities and watersheds.

Summaries of three of the models are presented in the following paragraphs.

The minimum level of management is Model 1 - The Homeowner Awareness Model. This program specifies management practices in areas of low environmental sensitivity. Treatment technologies are limited to conventional passive systems. Failures pose a relatively low level of risk to public health and water resources. The objectives of this management model are to ensure that all systems are sited, designed and constructed in compliance with sound, prevailing rules; all systems are documented and inventoried by the regulatory authority; and system owners are informed of the maintenance needs of their systems through timely reminders. This model, like all management programs described in this guidance, suggests the use of only trained and licensed/certified service providers. This model is a starting point for enhancing management programs.

The middle level of management is Model 3 - The Operating Permit Model. In this model, performance of onsite systems is critical to protect public health and water quality. This program might be appropriate in areas adjacent to estuaries or lakes where nutrient concentrations may be a concern or situations where a source water assessment has identified onsite systems as potential threats to drinking water supplies. EPA recommends that this be the minimum model used where large-capacity systems or systems treating high-strength wastewaters are present. Limited-term operating permits are issued to the property owner and are renewable for another term if the owner demonstrates that the system is in compliance with the terms and conditions of the permit. With complex systems, the treatment process requires more frequent inspections and adjustments, so process monitoring may be required. The operating permit provides a mechanism for continuous oversight of system performance and negotiating timely corrective actions or levying penalties if compliance with the permit is not maintained. To comply with these performance standards, the property owner should be encouraged to hire a licensed maintenance provider or operator.

The maximum level of management is Model 5 - The Responsible Management Entity (RME) Ownership Model. In this variation, ownership of the system is no longer with the property owner. The management entity owns, operates, and manages the decentralized wastewater treatment systems in a manner analogous to central sewerage. The RME maintains control of planning and management, as well as operation and maintenance. This management model is appropriate for environmental or public

health conditions similar to those for the RME Operation and Maintenance Model, but Model 5 provides a higher level of control of system performance.

CONCLUSION

Without an adequate O&M program all onsite systems are at risk of failure. Regulators, OEMs and owners share responsibility to ensure that these systems are adequately designed, installed, operated and maintained. All systems should be maintained by trained service providers. Program management should be implemented to provide oversight of O&M to minimize system failures that may affect public health and the environment.

There are now many sources available to assist in developing an O&M program. Regulators can use these sources in developing regulations, developing their training program and implementing program management. OEMs should continue to develop and upgrade their training and education programs. Both of these entities have a responsibility for educating and assisting owners in operating and maintaining their onsite systems.

WHO IS ADWA

ADWA is an association developed especially for companies that manufacture and market wastewater treatment devices certified as meeting the most recent version of ANSI/NSF Standard 40. ADWA will be at the forefront and will make a difference. We will develop an action plan to influence attitudes and regulations that affect the industry's well being. Together, leaders of the industry working together through ADWA can expand acceptance in the market through research, development, education, and lobbying efforts.

APPENDIX A - Notice to Occupant – Generic

NOTICE TO OCCUPANT

The wastewater that is produced by your residence or business is treated by , an advanced wastewater treatment system. The treatment unit is located on your property and is an on-site treatment system. Any on-site treatment and disposal system will work properly provided the occupants of the premises do not place harmful substances in the system. Therefore, certain standards must be followed in order to receive optimal performance from your system. You may be interested to know that most of these same standards are also important to follow even for those who are connected to a municipal or city sewer treatment system or conventional septic systems. Please refer to the list below for important information on how to help keep your treatment system performing as it should. In addition to these standards, all required maintenance must be completed in a timely manner.

DO NOT SHUT THE AERATION DEVICE (Notify your maintenance provider if it appears to be functioning improperly or if you will be leaving the property for an extended period of time.)

DISINFECTANTS OR BLEACHES
Use in accordance with manufacturers recommendations and sparingly. Quaternary ammonia sanitizers (found primarily in commercial settings) or pine oil cleaners should not be used.

MEDICATIONS
Normal use of over the counter medications should not affect the system. However, strong antibiotics or chemotherapy drugs have been known to severely disrupt the treatment process. Please notify your service provider of this kind of issue so they may be aware of the reason for the system upset.

DETERGENTS
Should be low-suds, biodegradable, and low phosphate. (Some examples are: Arm & Hammer, ALL, and Ecolab® Products (commercial use))

PAPER PRODUCTS
Use white toilet paper products. Some natural bacteria do not eat color dyes in paper and therefore do not breakdown colored paper. Non-bleached paper (brown in color) takes a long time to breakdown due to the increased level of wood pulp.

NO TOILET BOWL TABLETS SHOULD BE USED.

NO DISCHARGE FROM WATER SOFTENERS SHOULD GO INTO THE SYSTEM.

NO ANIMAL FATS, SUCH AS BACON GREASE, LARD, OR ANY OTHER OILS SHOULD GO INTO THE SYSTEM. (Normal cleaning of pots and pans is acceptable).

NO DRAIN CLEANERS SHOULD BE USED. (Vinegar and baking soda is good substitute. As a last resort chemical drain cleaners can be used, but use sparingly because they are toxic to the bacteria in the system.)

NO LIQUID FABRIC SOFTENERS SHOULD BE USED. (These products typically contain quaternary ammonia which is toxic to the bacteria. Please use dryer sheets.)

NO HARSH CHEMICALS OR TOXINS SHOULD BE PUT INTO THE SYSTEM
(i.e. Floor stripping waste / household paints / solvents / thinners / caustic cleaners / pesticides / herbicides etc.)

OBJECTS NOT TO BE PUT INTO THE SYSTEM

DISPOSABLE DIAPERS	CAT LITTER	SANITARY NAPKINS
BANDAGES	CIGARETTE BUTTS	AUTOMOTIVE FLUIDS
RAGS	STRING	STICKS
MUD	CONDOMS	PLASTICS
METAL OBJECTS	PAPER TOWELS	CORN COBS
ANIMAL BONES	MELON RINDS	COFFEE GROUNDS
HOME BREWERY WASTE	EGG SHELLS	OLD MEDICATIONS

Laundry Wash Loading
It is recommended that wash loads be spread throughout the week.

Septic Tank Additives, Enzymes, and Bacteria
Under normal circumstances these would be unnecessary with advanced treatment systems and not recommended for traditional septic systems.

APPENDIX B- Typical Testing Protocol

Testing Protocol for Wastewater Treatment System

At any time plants manufactured by XXXXX, Inc. can be tested for performance, it is imperative that samples are collected properly and analyzed by Standard Methods so that the results provide accurate representation of the performance of our plants. Flow-proportional composite sampling is the preferred sample collection method for accuracy. Grab sampling, while less costly and easier to collect, can result in misleading results and unnecessary or ineffective process changes. All representatives of XXXXX, Inc. will use the following protocol when sampling Wastewater Treatment Systems.

I. Sampling Equipment

A. It is required that equipment designed for proper sampling be used. All samples should be collected in sample bottles provided by a certified laboratory. A means to collect samples where the sampling point is difficult to reach shall be provided, i.e. a pole with a sampling container attached.

B. Each sample will require at least 3 labeled sample bottles.
   1. Samples collected for TKN and ammonia concentrations require a preservative and should have the preservative put in the bottles by the laboratory.
   2. Samples collected for NO3 and NO2 will have one bottle.
   3. Samples collected for BOD and TSS will have one bottle.
   4. Samples collected for pH may require another bottle.

C. Dissolved oxygen and pH meters that are calibrated at the site by a trained individual and a thermometer will be provided.

D. A sludge measurement device, such as a "Sludge Judge".

E. A logbook to record pH, DO and temperature will be provided. Sample time, flow conditions, sampler's name and a verbal description of the effluent indicating the relative amount of solids, the clarity, and any color or odor, detected will also be recorded.

F. A cooler stocked with wet ice will be provided every day that samples are to be collected.

G. A chain of custody sheet to be completed by the sampler.

H. A brush will be provided to facilitate cleaning of the effluent discharge pipe in preparation for the collection of effluent samples.

I. A garden hose with a back-flow preventor attached to the end hooked to the home. This will be used for inducing hydraulic flow for sampling in situations where there is not a free flowing effluent at the time of collection. The hose should be inserted into the wastewater system far enough upstream of the treatment system to induce the flow through the system, but not affect the sample collected in any way. The preventor is necessary to protect the water supply of the home from possible contamination. An apparatus should be supplied that would help hold the hose up out of the sewage when possible.

J. Antibacterial soap and distilled water will also be provided for cleaning of collection equipment.

K. Latex gloves and eye protection will be provided.

II. Sampling techniques

A. A grab sample must be taken from a free flowing effluent pipe. The pipe will most likely be located in a distribution box or pump chamber down stream from the treatment unit. It is very important that the pipe be cleaned (see D).

B. If flow is not present, connect the garden hose to an outdoor faucet. The hose should be inserted into the wastewater system far enough upstream of the treatment system to induce the flow through the system, but not affect the sample collected in any way. For most residential units this would be in the inlet to the septic tank. For this location, the hose should be placed in the inlet tee to best simulate influent into the septic tank. The hose should **not** be allowed to run at this location longer than 10 minutes.

C. Put on protective eye wear and latex gloves.

D. To the extent possible, use the brush to clean the discharge pipe of attached growth that may dislodge during the process of collecting Rinse the pipe with the garden hose. (**Note:** If the pipe is not accessible for cleaning in this manner – the sampler must be mindful not to touch the pipe when sampling to avoid knocking loose large solids that could contaminate the sample.)

E. Place the end of the garden hose in position to add water to the first compartment of the septic tank (See step B) – **not** the reaction chamber. Take care to not touch the sewage with the end of the hose. Turn the faucet on.

F. After the effluent has been flowing out of the pipe for a minimum of 10 minutes, place the collection container into the stream of effluent and rinse any collection containers (including sample bottles) that will contain effluent. **DO NOT** rinse TKN and ammonia sample bottles that contain a preservative.

G. If a free flowing sample cannot be taken from a pump chamber, then the operator must determine if the contents of the pump chamber are representative of the effluent. The first evaluation of whether this sample will be representative will be to determine if there are settable solids in the pump chamber. A sludge measurement device should be used to determine if there are any settled solids in the bottom of the pump chamber. If there are any solids, then the pump chamber must be cleaned out before a representative sample can be taken. The second test for evaluation of the pump chamber will be to measure the dissolved oxygen in the pump chamber. The dissolved oxygen in this chamber must be above 1.0 mg/l for the sample to be representative of an aerobic effluent. If the dissolved oxygen is below 1.0 mg/l, then the pump chamber should not be used for sampling. This information should be noted in the log as well as the other observations used to collect this sample.

H. Take the sample for pH and temperature and test for those parameters immediately. When finished with this sample discard it back into the system and rinse it several times with water.

I. Take the DO reading inside the reaction chamber and outside the unit in the anoxic zone of the tank.

J. Record the pH, DO and temperature in the logbook along with the date address and time.

K. Take the sample bottles and place them into the cooler with the wet ice. The bottles should be well covered by the ice in order to facilitate faster cooling.
L. Clean the sampling containers with antibacterial soap and water and rinse them with distilled water before collecting another sample.
M. Fill out the chain of custody sheet with correct sample ID numbers and all other required information and/or pertinent comments. Be sure and sign this sheet and observe the laboratory personnel signing it when you deliver a sample. The samples should be delivered the same day it is collected. If necessary arrangements should be made to deliver the samples after normal business hours.