Kentucky Wastewater Education Project

Section 319(h) Nonpoint Source Pollution
Implementation Grant
Final Report

Submitted by
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Executive Summary

Septic wastewater of human origin entering surface and subsurface waters remains a major concern in Kentucky, and continues to be recognized as a leading source of water pollution in monitored waterways in Kentucky (2). However, experts agree that onsite or decentralized wastewater treatment systems are appropriate options for meeting public health and water quality goals (4). This is true when onsite systems are properly selected, designed, installed, operated, and maintained. The overriding goal of the Kentucky Wastewater Education Project was *the establishment of an effective system of education that will provide needed training and outreach to all parties essential to solving onsite wastewater problems.* The project takes a lead role in protecting the quality of Kentucky's groundwater through a specific focus on proper onsite wastewater disposal.

Project activities were designed around three major objectives, summarized as follows:

- Development and implementation of statewide training to all individuals key to onsite wastewater solutions
- Providing access to technology demonstrations
- Continual monitoring and assessment of the program to meet audience needs

It was evident that training and outreach must extend to all parties essential to solving onsite wastewater problems. This broad definition included onsite practitioners (installers, inspectors/regulators, and service professionals), the public sector (decision-makers or those who influence decisions in local communities), and the private sector (real estate professionals, bankers, and homeowners). The project was able to build a foundation of resources that could be modified or adapted easily to the specific target audience based on information needs.

A few of the major accomplishments of the program during the grant period:

- Developed a working draft of the "Kentucky Wastewater Education Program Manual", representing a blueprint for onsite wastewater education in Kentucky
- Established a library of educational curricula that can be tailored to Kentucky, and initial conversion of those national resources to "Kentucky" versions
- Expanded communication of onsite information to over 3500 industry professionals from a central point of contact for Kentucky
- Increased the number of practitioner continuing education opportunities from six (providing 1,908 contact hours) in 2002 to 25 in 2007 (providing 7,722 contact hours)
- Developed, printed 25,000 total copies, and began distribution of three informational brochures targeting public and private sector audiences
- Incorporated 20 additional technologies for demonstration at the Kentucky Onsite Wastewater Training Center and achieved commitments for future demonstrations

Activity results, as well as continued response from target audiences, regulatory agencies, and other partners, indicate that the Kentucky Wastewater Education Project is well on its way to becoming an "institution" for Kentucky's onsite industry and is an appropriate avenue for addressing a major source of nonpoint source pollution.

Introduction and Background

Septic wastewater of human origin entering surface and subsurface waters remains a major concern in Kentucky. Septic waste, or perhaps more correctly stated, "improper treatment or lack of treatment of septic wastewater," is recognized as a leading cause of nonpoint source (NPS) pollution. The Kentucky Division of Water estimates that nearly 532 miles of Kentucky rivers and streams are impaired by residential related sources, the most significant of these being onsite wastewater treatment systems including straight pipe discharges (2). Nationally, the U.S. Environmental Protection Agency (EPA) has cited septic systems as the second greatest threat to groundwater quality from the viewpoint of state agencies (7). Pollutants associated with human waste include bacteria and other pathogens, nutrients and organic matter.

"Onsite" wastewater treatment systems rely on natural processes and/or mechanical components to collect and treat sewage from one or more dwellings, buildings, or structures, dispersing the resulting effluent on the owner's property (1). These "onsite" systems fit into a broader category of wastewater infrastructure known as "decentralized" wastewater systems. Decentralized wastewater treatment systems collect, treat, and disperse or reuse wastewater from individual homes, clusters of homes, isolated communities, industries, or institutional facilities at or near the point of waste generation (1). Decentralized systems, including onsite systems, treat relatively low volumes of wastewater, compared to centralized or municipal systems that collect and treat waste of numerous homes or businesses. The U.S. EPA, in its 1997 Response to Congress, acknowledged that adequately managed decentralized wastewater systems offer a cost-effective and long-term option for meeting public health and water quality goals (4). As a result, wastewater management strategies for many states today reflect infrastructures that are based on use of appropriate technologies, including both centralized and decentralized wastewater treatment systems.

Based on geography, site conditions, cost and other variables, onsite wastewater systems continue to be the most affordable source of wastewater treatment for rural and semi-rural Kentucky citizens. Nearly 45% of existing households (615,360) in Kentucky are not connected to centralized or municipal wastewater treatment systems (J. Smoak, pers. comm.). This statistic is somewhat higher than national trends that indicate decentralized wastewater technologies are used by about 25% of the existing homes in the U.S. and in approximately 33% of all new development (6).

In its assessment report released in 1999, the Kentucky Environmental Quality Commission (EQC) expressed concerns about the inconsistent and/or poor design of onsite sewage systems, and a lack of expertise and knowledge of alternative, low-cost systems (3). The report also revealed that poor operation and maintenance by system owners contribute to system failures (3). These factors set the stage for onsite wastewater's contribution to nonpoint source pollution, subsequently exposing citizens to unacceptable health hazards.

Many of those in the onsite industry agree that promotion of adequate operation and maintenance is needed to prevent pollution and protect public health. As recognized by the EQC, education must play a key role in dealing with onsite wastewater problems. Based on its study, the EQC developed seven key recommendations for Kentucky. Recognizing the limited funding and staff within lead state agencies, the EQC supports partnerships that promote collaborative and innovative solutions to address onsite sewage problems (3). The EQC, in Recommendation #2, called upon state agencies to prepare an Action Plan to improve onsite sewage programs in Kentucky (3). The desired action plan would address a number of elements, including:

- development of state/community partnerships to implement innovative onsite technology and demonstration projects
- promotion of consistent design criteria for onsite sewage systems
- development of measures to promote proper operation and maintenance of onsite systems
- development of a statewide education/outreach initiative
- strengthened training for onsite professionals

Recommendation #6 specifically called for a public education program to reach homeowners, lenders, realtors, homebuilders, etc., building awareness of proper onsite sewage treatment and disposal (3).

The Kentucky Onsite Wastewater Association, Inc., (KOWA) is a non-profit organization formed in 1995 to bring together all segments of the state's onsite wastewater industry, including installers, regulators, manufacturers, and service professionals (pumpers). The organization is dedicated to raising the professionalism of the onsite industry, thereby positively affecting public perception of onsite issues. Early efforts of KOWA revolved around the development of relationships among the various onsite industry sectors, as well as establishing external partnerships that would, in the long-term, assist in providing solutions to onsite wastewater issues. While the Kentucky Wastewater Education Project is an extension of KOWA's early efforts, the project actively addresses several of the key recommendations made by the EQC. Through this project, KOWA has taken a lead role in protecting the quality of Kentucky's groundwater through its focus on proper onsite wastewater disposal. In turn, the project has been a vital tool in advancing the visibility of the organization among Kentucky's onsite industry participants and public and private sector audiences. Today, the organization is recognized as a leading resource for onsite wastewater information.

The Kentucky Wastewater Education Project, as proposed by KOWA in its original 319(h) workplan in 2000, set forth as its primary goal *the establishment of an effective system of education that will provide needed training and outreach to all parties essential to solving onsite wastewater problems.* It was evident then, and remains true today, that a comprehensive system of education reaching both onsite industry practitioners and the public is essential to addressing wastewater disposal issues. An educational program directly targeting onsite wastewater issues will ultimately assist in improving degraded water quality resulting from non-existent, inadequate, and failing onsite systems, and

contribute to the future protection of limited surface and groundwater resources from this form of nonpoint source pollution.

Three major objectives were outlined for the project:

1. *Develop and implement a system that can effectively coordinate and administer training statewide to all individuals key to onsite wastewater solutions, resulting in an organizational structure responsive to industry needs.*

An effective system of training requires curriculum tailored to the specific audience (installers, regulators, homeowners, etc.) and based on available science, suitability to Kentucky conditions, regulatory requirements, practical design, sound installation techniques, and proper operation and maintenance procedures. Training must be designed to keep onsite professionals up-to-date with changing technologies and information, as well as helping to raise the level of public awareness of wastewater and NPS issues, including watersheds, water quality and water pollution.

2. *Build a system of technology demonstrations and coordinate with the National Onsite Demonstration Project.*

Many areas of Kentucky are considered unsuitable for "conventional" septic systems due to topography, poor soils, and other factors that prohibit adequate wastewater disposal. These conditions indicate that alternative, advanced, or new onsite or decentralized technologies must be considered as potential methods for wastewater disposal.

Onsite technologies can efficiently treat waste at or near the site of origin, can recycle water at that same site, require few chemicals or power inputs, and therefore fit into the framework of sustainable community development. This is true when the onsite technology is properly selected, installed, and maintained. Current technologies exist, and new technologies are continually being developed, which can effectively reduce nonpoint source pollution attributed to decentralized wastewater treatment systems.

The industry in Kentucky, however, is somewhat limited in the use of new treatment systems on problem sites because there is no systematic means to introduce these advanced treatment systems to onsite practitioners. Integration of technology demonstrations into training and education efforts is an important component of the project. The project embarked on the expansion of technology demonstrations to educate practitioners and the public on the wide array of available systems. Technology demonstrations provide target audiences with information that allows and encourages them to select the appropriate BMP (Best Management Practice), as well as properly install and maintain the system.

This objective supports not only recommendations by the EQC, but also an EPA recommendation made specifically for Kentucky wastewater issues. The EPA advised that onsite systems should continue to be evaluated objectively under local conditions, and that "care should be taken not to stifle innovation" (5).

3. *Develop and implement a monitoring and assessment plan for overall program effectiveness.*

Program evaluation is a necessary function for determining the success or effectiveness of the project. Whether the program meets industry needs and increases public awareness are important questions in continuously improving the quality of the program. Evaluation assists in identifying long-term needs, as well as determining the strategies necessary for future sustainability.

Materials and Methods

Methods used to achieve project goals and objectives were outlined in the original workplan as a series of broad-based activities. The "Results" section of this report contains more in-depth information on each activity and its related tasks, as well as the progress and status of the activity. Following is a brief overview of the primary materials and methods used to accomplish the six project activities:

Activity #1 – Course Design/Curriculum Development *(Obj. 1)*

This activity focused on curricula tailored to specific audiences (installers, regulators, private sector, and homeowners) and based on available science, suitability to Kentucky conditions, regulatory requirements, practical design, sound installation techniques, and proper operation and maintenance procedures.

Curricula were researched and obtained from national sources for subsequent "tailoring" for use in Kentucky. This activity was led by project staff and KOWA's Education Committee, representing various segments of the onsite industry. This activity had a large learning curve, but is now in place for expediting future curriculum development. Utilization of existing sources and materials is a cost-effective method of generating appropriate curriculum. Kentucky materials created under this project can easily be updated as regulations or changes occur in the state's onsite arena.

Activity #2 – Communication System *(Obj. 1)*

The Kentucky Wastewater Education Project must result in an organizational structure that is continually responsive to target audience needs. Preliminary efforts with the communication system have focused on practitioner communications. The key to continued education of onsite industry professionals is effective communication of available programs, technology up-dates, and new information. Therefore, KOWA continues to partner with appropriate state agencies and other organizations to improve upon practitioner communications. As part of KOWA's development of a communication system, a training notification system has been established to include notification through special mailings, newsletters, a website, Cabinet for Health Services, and all local health departments in the state. E-mail notification has begun on a limited basis, primarily with state and local regulators and manufacturers. While onsite system installers and service professionals comprise the largest segment of practitioners in Kentucky, the majority do not have internet capability.

Other target audiences include public sector individuals such as local officials and the private sector, including real estate and banking professionals and homeowners. Thus far, personal contact and the website are the primary means of communicating with these audiences.

This activity, led by project staff, focused initially on database development utilizing Microsoft Access. Databases were obtained and/or developed from internal data collection, as well as state and industry sources. Again, tasks focused initially on practitioners.

Activity # 3 – Statewide Training Program *(Obj. 1)*

A statewide training program forms the basis of the entire Kentucky Wastewater Education Project. KOWA's intent is to orchestrate, in partnership with state agencies and other organizations, a training system available statewide to all individuals key to onsite wastewater solutions. These individuals include professionals (installers, regulators, operation & management providers); public sector (planning & zoning or other public officials); and the private sector (realtors, bankers, developers, homebuilders). Homeowners (as responsible onsite management entities) are also deemed a part of the private sector. These target audiences are described more thoroughly in Appendix C.

Training is designed to keep onsite professionals up-to-date with changing technologies, regulatory issues, and other information, as well as helping to raise the level of public awareness of wastewater disposal and NPS issues. In addition to required state certification, the long-range vision for the training program incorporates specific courses of study (levels of certification) for onsite practitioners.

This activity was directed by project staff, the Education Committee, and the KOWA Board of Directors. Outside instructors with specific onsite wastewater knowledge and experience were retained to provide statewide training opportunities.

Materials used included programs or presentations previously developed by KOWA. As curriculum and public outreach materials were completed in activities #1 and #5, respectively, these materials began to replace older programs. Training delivery methods to-date are primarily classroom presentations, using PowerPoint presentations and equipment required for such presentations. Technology demonstrations, discussed in Activity #4, have been incorporated into the training program to provide a needed hands-on element.

Activity #4 – Installation of Technology Demonstrations *(Obj. 2)*

Technology demonstrations were needed to demonstrate the wide array of available systems and appropriateness for varying sites. These systems provide both practitioners and land users with sound information on new and existing technologies, allowing them to select the appropriate BMP (Best Management Practice), as well as properly install and maintain the system. In addition, the demonstrations are accessible to other project leaders seeking BMP information for specific nonpoint source pollution control efforts. The technology demonstrations include existing and proven BMPs, both those currently in use in Kentucky and those used in other areas of the U.S. that might be suitable for use in Kentucky. During the grant period, additional technologies were donated by system

manufacturers and distributors. These were installed at the Kentucky Onsite Wastewater Training Center, a demonstration site located on the Anderson Campus of the Bluegrass Community and Technical College in Lawrenceburg, Kentucky.

This activity was directed by project staff and Education Committee members, working with system contributors to complete installations.

Activity #5 – Public Outreach Program *(Obj. 1)*

This activity reaches beyond the practitioner, targeting the public and private sectors. Briefly, the public sector includes those individuals involved in the decision-making processes affecting land use in local communities. The private sector includes individuals such as bankers, realtors, and property owners. The Kentucky Wastewater Education Program Manual (Appendix C) defines these two target audiences in greater detail.

Three primary methods have been used to-date to initiate the public outreach segment of the project. These include publications, website, and personal contacts. Materials were researched and obtained from existing sources, revised to meet the needs of the project, and distributed across the state. Publications completed are detailed in the Results section of this report. The website, www.kentuckyonsite.org, was continually modified to provide additional information, including posting of outreach materials. Additionally, a number of methods were utilized to reach the public directly, including presentations, exhibits, and demonstration tours. These are also discussed further in the Results section of the report.

Activity #6 – Program Monitoring and Assessment *(Obj.3)*

The Kentucky Wastewater Education Project included ongoing assessment to determine overall program quality and future direction. Post-class evaluation forms were completed by training attendees. A copy of the form is included in Appendix D. In addition, direct contact with instructors, training cooperators, and target audience groups provided feedback on quality of programs and materials. The KOWA Education Committee, Board of Directors, and project staff used information gained from these contacts to plan activities, modifying as needed or indicated by evaluation. This allowed leadership to improve upon project activities to meet the needs of the target audiences.

The activity also included development of both an evaluation plan and a sustainability plan for the model program (Appendix C). Monitoring and assessment activities are discussed in more detail in the Results section.

This activity focused on monitoring of education and outreach activities. Since no "functioning" wastewater BMPs were planned or installed as part of the project, no water quality monitoring was required during the project.

Results and Discussion

<u>Objective #1</u>. Develop and implement a system that can effectively coordinate and administer training statewide to all individuals key to onsite wastewater solutions, resulting in an organizational structure responsive to industry needs.

<u>Activity #1 – Course Design/Curriculum Development</u>

Measures of Success:

- Obtain and/or develop sufficient curricula for implementing targeted instruction.

Milestones:

a. Form Curriculum Committee
   - Identify/define target audiences
   - Define message objective for each target audience
   - Identify curriculum needs of each target audience

b. Search/review/select existing curricula
c. Adapt/develop curricula
d. Develop training modules, teaching manuals, course materials
e. Finalize curricula, training modules, teaching manuals, course materials
f. Print/produce curricula, training modules, teaching manuals, course materials
g. Annual review and update of curricula/course materials
h. Develop/implement additional curricula/course materials
i. Annual review and update of curricula/course materials

Progress and Accomplishments:

- The Kentucky Onsite Wastewater Association (KOWA) Education Committee served as the "Curriculum Committee." Committee members represented various segments of the onsite industry, including manufacturers, public health environmentalists, and installers. The committee met as needed to guide the project in the areas of training and curriculum development.

- The curriculum committee identified the various target audiences, as well as the appropriate message and curriculum or training needed by each group. Target audiences include onsite practitioners, public sectors, and private sectors. Target audiences are described in the "Kentucky Wastewater Education Program Manual" (Appendix C).

- Project staff requested curricula from Washington State University, Texas A&M, SUNY Morrisville Environmental Training Center, Minnesota Onsite Sewage Treatment, Bell 4160 (Arkansas), the Coastal Institute (RI), Pace University Environmental Center, National Onsite Demonstration Program (NOPD), Washington On-Site Sewage Association (WOSSA), National Onsite Wastewater Recycling Association (NOWRA), the Consortium of Institutes for Decentralized Wastewater

Treatment (CIDWT), National Small Flows Clearinghouse (NSFC), North Carolina Department of Environmental and Natural Resources (NCDENR), and University of Maine Extension Service. A variety of information was received from the majority of these organizations, including PowerPoint presentations, training outlines, videos, manuals, and other materials. In addition, system manufacturers provided materials and literature related to specific onsite technologies. These materials allowed KOWA to begin accumulating a library of information as a starting point for curriculum development.

- A long-range plan for curriculum development, modeled after that of the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT), has been developed during the course of the project. Appendix C, "Kentucky Wastewater Education Program Manual," contains the long-range curriculum development plan and status of individual courses and materials.

- Using various materials from national resources as a starting point, project staff and committee members began reviewing and tailoring courses specifically to Kentucky. Following the internal review and development process, courses were submitted to the Kentucky Division of Water for review, comment, and approval for publication. Courses appropriate for installer education were also submitted to the Kentucky Department for Public Health for review, comment, and approval. To-date, nine courses have been fully developed under the plan and others are in various stages of draft as outlined in the curriculum development plan contained in Appendix C. Care was taken to ensure that there was uniformity in the curriculum set. Each completed course includes an instructor's manual, student manual, and PowerPoint presentation. In each of those elements, similar formats contribute to ease of use of the documents and to portray the materials as part of a series of works. Completed courses include:

  SEPTIC 1: Your Onsite Wastewater Treatment System-A Homeowner's Manual
  This course describes the basic septic system and its typical modifications. The course will help homeowners understand how their system works and what they need to do to maintain its effective operation for the long term. This course provides information on the basic function and operation of the septic tank and disposal components of the conventional onsite system. The course includes information needed for homeowners to properly care for their systems and recognize problems that may result from misuse. Presentations of the course will focus on system components, installation, maintenance, and regulatory requirements of the primary treatment technologies commonly used by the individual homeowner.

  ONSITE 101: Introduction to Soils and Site Evaluation
  This introductory course describes the basic concepts of soil and site evaluation. It will help the practitioner understand how soils and sites are evaluated. The course provides information on soil characteristics and site features related to onsite wastewater systems and disposal components. It includes information needed for the practitioner to properly evaluate soils and site conditions and recognize problems that

may result from an improper evaluation. Presentations will focus on Kentucky's soil and site evaluation requirements.

ONSITE 110: Septic Tanks and Effluent Filters
Onsite 110 provides an introduction to the design, construction, and installation of septic tanks and effluent filters used for conventional onsite wastewater treatment systems. The course describes the criteria for selection of the appropriate components and proper installation procedures. This course primarily relates to technologies used for single-family onsite wastewater systems. The course is designed for practitioners, but is also appropriate for other audiences including homeowners.

ONSITE 140/141: Introduction to Wastewater Microbiology & Chemistry
This course describes the basic concepts of wastewater microbiology and chemistry. The course will help the practitioner better understand how an onsite system works and how to maintain its function for the long term. It provides information on the basic biological and chemical functions of onsite wastewater system and disposal components. The course includes information needed for the designer, installer, and inspector to properly manage the system and recognize problems that may result from misuse. Presentations of the course will focus on the biological and chemical processes occurring in the system. This course primarily relates to treatment technologies used by individual homeowner systems and decentralized cluster systems.

DESIGN 099: Basic Conventional Onsite Wastewater Treatment System Design
This introductory course describes the basic design criteria for conventional onsite wastewater treatment systems. The course will help certified inspectors, installers and homeowners understand how systems are sized and designed under a variety of site situations. This course provides information on the sizing of septic tanks and lateral fields using Kentucky's regulatory requirements. Presentations will focus on the sizing techniques and common site conditions.

DESIGN 202: Low-Pressure Piping Systems
Design 202 describes the basic sizing, design, and installation concepts for low-pressure piping systems. The course will help the practitioner or others understand how the system works and how to maintain its effective, long-term operation. This course provides information on the basic function and operation of the low-pressure piping system and its major components. The course includes information needed for the onsite professional and the homeowner to properly care for the system and recognize problems that may result from misuse. Presentations will focus on the sizing, components, installation, maintenance, and regulatory requirements of the low-pressure piping system. This course largely relates to low-pressure piping systems used for an individual residence.

ATS 100/101: Onsite Wastewater Technology Overview
This course provides general information on the complete range of onsite wastewater technologies, from the most basic to the most complex. The course includes

information needed to select the appropriate set of components to make up the wastewater system for any given site. Presentations will focus on technologies currently available in the industry, as grouped by the type of component. This course primarily relates to technologies used for individual and cluster onsite wastewater systems. Many of the technologies presented are also common in systems with larger flows, but larger flows are outside the purview of this course. The course contains materials for a one or two-day program. The course is appropriate for all target audiences.

O&M 204: Composting Operations
O&M 204 provides general information on the complete range of composting technologies, from the most basic to the most complex. The composting process consists of different technologies and components defined by process. The course includes information needed to select the appropriate set of components to make up the composting system for any given site. Presentations will focus, in varying levels of detail, on the technologies as grouped by the type of component. This course primarily relates to technologies used for treatment of wastewater sludge, pumping from septic tank and other biological wastewater treatment systems. The proven technologies presented are in use across the United States and North America. The target audience for the course is onsite service professionals (pumpers).

O&M 205: Land Application Operations
O&M 205 provides general information on the complete range of land application technologies, from the most basic to the most complex. The land application process consists of different technologies and components defined by process. The course includes information needed to select the appropriate set of components to make up the land application system for any given site. Presentations will focus, in varying levels of detail, on the technologies as grouped by the type of component. This course primarily relates to technologies used for treatment of wastewater sludge, pumping from septic tank and other biological wastewater treatment systems. The proven technologies presented are in use across the United States and North America. The target audience for the course is onsite service professionals (pumpers).

Activity Assessment and Additional Comments:

This activity proved to be a massive undertaking during the early years of the project and required more time than originally anticipated. Some of the reasons for delay included lack of communication and oversight between assigned staff, unclear plan for prioritizing courses, and differing opinions on content and uniform formats. As KOWA and project leadership gained experience (through trial and error), the curriculum development process became more streamlined, thus delays were addressed and reduced. Future curriculum development will progress more smoothly based on several factors:

- The learning process has provided KOWA with a greater level of experience in curriculum review and development.

- KOWA now has a formalized development plan that will allow it to better prioritize material needs.
- Project leadership has identified and possesses appropriate external materials for many of the planned courses, allowing curriculum "tailoring" to be expedited.
- New materials will utilize the standard format that has been established to provide consistency in layout and content, allowing specific technical elements of each manual to be replicated quickly and easily.

This activity is ongoing and KOWA expects to continue with curriculum development to support current education and training efforts until such time as the model education program envisioned for Kentucky may be fully instituted. (Appendix C)

Activity #2 – Communication System

Measures of Success:

- Complete a communications system serving all onsite professionals by the end of the 3-year project.

Milestones:

a. Develop communication system
b. Implement communication system

Progress and Accomplishments:

- Preliminary databases have been established and are in use to communicate with over 3500 onsite professionals in the state. These include Kentucky health department environmentalists, state and national onsite system manufacturers and/or distributors, Kentucky septic tank manufacturers, Kentucky pumpers (service professionals), and Kentucky certified installers. These databases are used to reach the various target audiences through mass or specialized mailings. A small number of these database contacts, primarily state and local agency contacts and onsite manufacturers, can also be reached through e-mail communications. As stated earlier, the majority of onsite practitioners in Kentucky, i.e. installers and pumpers, do not yet possess internet capabilities.

- KOWA's website, (www.kentuckyonsite.org), is also an important component of the communication system in place. The website extends beyond database capabilities by reaching not only onsite industry professionals, but also public and private sector audiences.

Activity Assessment and Additional Comments:

During the course of the grant period, KOWA has reviewed two national "operation and management" programs with varied database/communication features. At this time, neither has been deemed by KOWA leadership as fully appropriate for Kentucky.

This activity is evolving as target audience information becomes available. Current databases include full mailing information for all audiences, but lack additional contact information such as e-mail addresses. As this information is gained, an increased number of recipients can be reached electronically.

Additional work is needed to improve upon the current communication system:

- The databases must be merged to provide staff the ability to use queries to single out specific audiences for targeted communications. This can be accomplished currently with the individual databases, but duplication can occur as some recipients cross over into multiple databases. Merging of databases will eliminate this problem.
- Tracking of training should take place within the communication system. Currently, tracking of training occurs in a separate program on an annual and class basis.

Addition of a tracking feature will allow training attendance to be assigned to the specific individual.

- Web-based features should also be considered. For example, training attendees should be able to access individual training history through the existing website.

These improvements will make the organization's communication processes more efficient in terms of staff time and other costs by restructuring current methods used in providing notification of training and demonstration opportunities to the appropriate target audiences, documenting outreach efforts, documenting industry training and certification levels, and submittal of required documentation to appropriate agencies.

Activity #3 – Statewide Training Program

Measures of Success:

- Develop a graded certification system for installers and service professionals.
- Conduct a minimum of six (6) on-site trainings per year at the Kentucky Onsite Wastewater Training Center.
- Conduct a minimum of four (4) off-site trainings per year throughout the state.
- Completion of long-distance delivery mechanisms.
- Conduct a minimum of two (2) trainings per year during year 2 and 3 of the project through long-distance delivery methods.
- Complete a minimum of twelve (12) video training programs.

Milestones:

a. Develop program manual
b. Determine levels of certification for courses/training
c. Obtain Cabinet for Health Services approvals for curriculum and training
d. Finalize program manual
e. Print/produce program manual
f. Identify/implement training delivery methods
g. Develop/implement additional training materials
h. Prepare training schedule
i. Conduct training program
j. Annual review and update of training program

Progress and Accomplishments:

- A working draft of the "Kentucky Wastewater Education Program Manual" has been developed by project leadership and is attached as Appendix C. This draft manual is currently intended as an internal guidance document to assist staff and leadership of KOWA, as well as its current or potential partners, in visualizing, shaping, and implementing education and outreach efforts of the Kentucky Wastewater Education Program. The manual includes work completed to-date, but also encompasses a long-range vision for future efforts.

- Based on the long-range curriculum plan discussed earlier, KOWA has formally outlined programs of study (i.e. certification levels) envisioned for each target audience. For onsite practitioners, completion of various programs of study would result in a specific certification termed Installer I, II, or III, Service Professional I or II, or Inspector I, II, or III. At this time, such a certification program would exceed current state requirements for onsite practitioners. This issue is discussed more fully under the *Activity Assessment and Additional Comments* for Activity #3. For the public or private sectors, specific courses of study are recommended as part of the educational effort, but formal certification programs for these target audiences are unnecessary. Appendix C details these programs of study and certifications.

- During the 5-year grant period, 30 trainings were conducted at the Kentucky Onsite Wastewater Training Center (Table 1). The total number of participants reached was 716. Each training consisted of both classroom presentation and a tour of the demonstration site. Agendas are attached (Appendix D).

Table 1. On-site Trainings held at Kentucky Onsite Wastewater Training Center

Date	Topic	#Attendees
6/1/02	Effluent Filters & Maintenance, Onsite Pump Controls, Wastewater Characteristics, Onsite Microbiology	6 Installers
3/8/03	Septic Tanks, Effluent Distribution, Biosolids Land Application, Soils Module, Wastewater Characteristics	38 Installers 1 Regulator
3/29/03	Septic Tanks, Effluent Distribution, Biosolids Land Application, Soils Module, Wastewater Characteristics	100 Installers
4/19/03	Septic Tanks, Effluent Distribution, Biosolids Land Application, Soils Module, Wastewater Characteristics	20 Installers
2/27/04	Alternative Technology Overview & O&M (non-319 – funded by PRIDE)	11 Eastern Ky. Pride Staff
3/13/04	Alternative Technology Overview & O&M	34 Installers
3/27/04	Alternative Technology Overview & O&M	63 Installers
4/10/04	Alternative Technology Overview & O&M	8 Installers
5/14/04	SJE Rhombus Pump Panel, Zabel Environmental SCAT	# unknown
5/21/04	Bio-Microbics FAST System, Geoflow Drip Distribution	19 Installers
7/22/04	Netafim Drip System, Puraflo Peat Treatment, Septic Tank Filters and Risers	6 Installers 4 Regulators 1 Other
10/15/04	Alternative Technology Overview & O&M	2 Installers
2/12/05	Onsite Microbiology; Confined Spaces & Microbiological Hazards	13 Installers
3/7/05	Onsite Microbiology	10 Installers 2 Other
3/28/05	Confined Spaces & Microbiological Hazards	8 Installers
4/16/05	Onsite Microbiology; Confined Spaces & Microbiological Hazards	29 Installers 1 Other
5/21/05	Onsite Microbiology; Confined Spaces & Microbiological Hazards	36 Installers
6/11/05	Soils Modules	8 Installers
1/20/06	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	19 Installers
2/24/06	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	14 Installers
3/31/06	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	37 Installers
4/14/06	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	4 Installers

4/28/06	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	11 Installers 2 Regulators
5/26/06	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	24 Installers 2 Regulators
6/30/06	Pump Sizing, Septic Tanks/Filters, Alternative Technology Overview, Soils Modules	21 Installers
10/13/06	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	11 Installers
2/23/07	Onsite 110-Septic Tanks & Effluent Filters	24 Installers
3/31/07	Onsite 101-Intro. To Soils & Site Evaluation	46 Installers
4/30/07	Design 099 – Basic Conventional System Design	34 Installers
5/30/07	Onsite 110-Septic Tanks & Effluent Filters	23 Installers 2 Regulators
6/29/07	Onsite 101-Intro. To Soils & Site Evaluation	21 Installers 1 Regulator
	TOTALS	689 Installers 12 Regulators 15 All Other 716 Total

- During the 5-year grant period, 53 trainings were conducted throughout the state with a total of 2,878 attendees (Table 2). Agendas are attached (Appendix D).

Table 2. Off-site (statewide) Trainings

Date	Location	Topic	Attendees
6/24/02	Louisville	Trench Safety (Ky. OSHA)	10 Plumbers
12/19-20/02	Louisville	Various Conference Topics (non-319- funded by KOWA)	122 Installers 37 Regulators 44 Manufacturers 22 Other
10/13/03	London	Alternative Technology Overview & O&M (non-319 – funded by PRIDE)	32 Installers 8 Regulators
10/31/03	Prestonburg	Alternative Technology Overview & O&M (non-319 – funded by PRIDE)	32 Installers 8 Regulators
11/14/03	Columbia	Alternative Technology Overview & O&M (non-319 – funded by PRIDE)	22 Installers 9 Regulators
12/10-12/03	Louisville	Various Conference Topics (non-319- funded by KOWA)	119 Installers 31 Regulators 44 Manufacturers 21 Other
3/5/04	Nicholasville	Alternative Technology Overview & O&M	32 Installers

12/1-3/04	Louisville	Various Conference Topics (non-319- funded by KOWA)	111 Installers 30 Regulators 4 Pumpers 40 Manufacturers 27 Other
1/26/05	Alexandria	Water & Wastewater Characteristics; Alternative Technology Overview	53 Installers
3/12/05	Louisville	Onsite Microbiology; Confined Space & Microbiological Hazards	24 Installers
3/24/05	Somerset	Onsite Microbiology; Confined Space & Microbiological Hazards	7 Installers
3/31/05	Springfield	Basic Electric; Trench Safety; Pump Sizing; Onsite Microbiology	33 Installers
8/19/05	Springfield	Soils Modules	15 Installers 1 Engineer
12/15-16/05	Louisville	Various Conference Topics (non-319- funded by KOWA)	122 Installers 45 Regulators 32 Manufacturers 1 Designer 13 Other
1/11/06	Shepherdsville	Secondary Treatment; System Maintenance; Tanks/Filters; Wastewater Characteristics	29 Installers
1/11/06	Independence	Soils Modules	76 Installers
1/13/06	Lancaster	Water & Wastewater Characteristics; Confined Space/Microbiological Hazards	25 Installers
1/25/06	Shelbyville	Overcoming Site Limitations; Alternative Technology Overview; Confined Space/Microbiological Hazards	42 Installers
1/26/06	Powerderky	Overcoming Site Limitations; Alternative Technology Overview; Confined Space/Microbiological Hazards	34 Installers
1/27/06	Morganfield	Overcoming Site Limitations; Alternative Technology Overview; Confined Space/Microbiological Hazards	19 Installers
2/1/06	Buckner	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	34 Installers
2/8/06	Shelbyville	Overcoming Site Limitations; Alternative Technology Overview; Confined Space/Microbiological Hazards	36 Installers
2/10/06	Cynthiana	Overcoming Site Limitations; Alternative Technology Overview; Confined Space/Microbiological Hazards	50 Installers

2/15/06	Morehead	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	21 Installers
2/15/06	Harrodsburg	Overcoming Site Limitations; Alternative Technology Overview; Confined Space/Microbiological Hazards	25 Installers
2/17/06	Lexington	Overcoming Site Limitations; Alternative Technology Overview; Confined Space/Microbiological Hazards	19 Installers
2/25/06	Somerset	Overcoming Site Limitations; Alternative Technology Overview; Confined Space/Microbiological Hazards	19 Installers
2/28/06	Nicholasville	Overcoming Site Limitations; Alternative Technology Overview; Confined Space/Microbiological Hazards	20 Installers
3/4/06	Elizabethtown	Overcoming Site Limitations; Alternative Technology Overview; Confined Space/Microbiological Hazards	28 Installers
3/10/06	Hartford	Overcoming Site Limitations; Alternative Technology Overview; Confined Space/Microbiological Hazards	45 Installers
3/11/06	Somerset	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	33 Installers
3/18/06	Ravenna	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	26 Installers
4/8/06	Albany	Overcoming Site Limitations; Alternative Technology Overview; Wastewater Characteristics	10 Installers
1/24-25/07	Lexington	Various Conference Topics (non-319- funded jointly by KOWA and Ky. Assoc. of Milk, Environmental & Food Sanitarians)	80 Installers 250 Regulators 36 Manufacturers 41 Other
2/2/07	Morganfield	Onsite 101-Intro. To Soils & Site Evaluation	26 Installers
2/3/07	Ravenna	Design 099-Basic Conventional System Design	25 Installers
2/6/07	Lancaster	Onsite 110-Septic Tanks & Effluent Filters	30 Installers
2/8/07	Cynthiana	Onsite 110-Septic Tanks & Effluent Filters	43 Installers
2/14/07	Harrodsburg	Onsite 101-Intro. To Soils & Site Evaluation	31 Installers
2/15/07	Shelbyville	Onsite 101-Intro. To Soils & Site Evaluation	40 Installers

2/16/07	Benton	Onsite 101-Intro. To Soils & Site Evaluation	63 Installers
2/16/07	Buckner	Onsite 101-Intro. To Soils & Site Evaluation	36 Installers
2/17/07	Powerderky	Onsite 101-Intro. To Soils & Site Evaluation	28 Installers
2/23/07	Shelbyville	Onsite 101-Intro. To Soils & Site Evaluation	40 Installers
2/24/07	Somerset	Design 099-Basic Conventional System Design	22 Installers
3/9/07	Paducah	Overcoming Site Limitations, Fill & Wait, Wastewater Characteristics	74 Installers 3 Regulators
3/9/07	Independence	Onsite 110-Septic Tanks & Effluent Filters	78 Installers
3/14/07	Morehead	Onsite 110-Septic Tanks & Effluent Filters	16 Installers
3/15/07	Maysville	Onsite 101-Intro. To Soils & Site Evaluation	9 Installers
3/17/07	Somerset	Onsite 101-Intro. To Soils & Site Evaluation	38 Installers
3/23/07	Lexington	Design 099-Basic Conventional System Design	40 Installers
3/24/07	Elizabethtown	Onsite 110-Septic Tanks & Effluent Filters	40 Installers
3/30/07	Hartford	Design 099-Basic Conventional System Design	47 Installers
		TOTALS	2,121 Installers 421 Regulators 336 All Other 2,878 Total

- As seen in Table 2, the number of off-site trainings held annually increased from just six in 2005 to 19 in 2006 and 20 in 2007. In order to maximize resources, KOWA collaborated with health departments and community colleges on the local level. By working with these "cooperators," KOWA was able to increase the number of trainings across the state and reach a larger percentage of the practitioner audience. A total of 18 cooperators participated in 2006 and 2007.

- Long-distance delivery mechanisms have been initiated, in partnership with the Bluegrass Community and Technical College System (BCTCS). The video-conferencing technology is based at the Lawrenceburg Campus of BCTCS, which is also the host site of the Kentucky Onsite Wastewater Training Center.

Activity Assessment and Additional Comments:

This activity focused specifically on Kentucky's onsite practitioners, primarily installers and inspectors. At this time, classroom training is the most appropriate delivery method

for presenting educational content to this audience. Instructor-led classroom training allows for interactive discussion with practitioners and overcomes constraints such as varied educational levels and experience of the target audiences. It is important that all programs, including tele-conferencing or video training, be led by a qualified instructor. This creates additional logistical and cost considerations that must be addressed in the future if such programs are deemed appropriate for practitioner audiences. It is likely that long-distance and video delivery methods are more appropriately geared to public outreach efforts for private and public sector audiences rather than onsite practitioners.

While the curriculum being developed under this project can be utilized in Kentucky's existing arena for onsite practitioner education as well as for public outreach purposes, a true "statewide training" program for practitioners remains visionary at best. Currently, Kentucky has minimal education requirements for onsite wastewater practitioners. Individuals seeking to become certified installers must complete a one-time test for which there is no preparatory educational requirement. After the first year, installers must attend six contact hours of training annually in order to maintain their certification. Licensed pumpers located in Kentucky have no education or training requirements. Local health regulators receive training in onsite as "new" regulators, but have no annual onsite training requirements. It is hoped that the "practitioner education" segment of the model education program drafted under this project (Appendix C) will promote further discussion and working partnerships with the state's onsite regulatory agencies to determine and establish an appropriate and comprehensive education infrastructure. An appropriate statewide training program will be one that provides value to individual practitioners and results in increased expertise in installation, operation, and management of onsite wastewater treatment systems across Kentucky.

Activity #5 – Public Outreach Program

Measures of Success:

- Develop and distribute 5000 informational brochures to target groups.

Milestones:

a. Develop public outreach marketing plan
b. Draft materials for public outreach program
c. Implement public outreach program
d. Review of public outreach program

Progress and Accomplishments:

- An "Outreach and Marketing Plan" has been developed for the model education program. The plan is focused on three target audiences: practitioners, the public sector, and the private sector. These target audiences, message objectives, information needs, and delivery methods are described in Appendix C.

- Following is an overview of material development for public outreach:

  "*A Kentucky Homeowner's Guide to Septic Systems*" was completed, approved, and distributed. The original supply of 5,000 copies was exhausted in January 2006. Funding was sufficient for an additional printing of 10,000 copies. The revision and second printing addressed homeowner groundwater protection plan requirements.

  The publication has been distributed to homeowners through a variety of methods. Copies were provided to certified installers at all educational venues for further distribution to their customers (homeowners), as well as provided to installers on request for this purpose. For example, one installer requested multiple copies for distribution at the 2007 Home and Garden Show held in Louisville, Kentucky. Copies were also provided to local health departments for distribution to the public in their respective counties. These copies were provided to health departments during visits to the Kentucky Onsite Wastewater Training Center, annual conference, statewide trainings, or other opportunities. At least one county (Jessamine) utilized the publications in a planned "Homeowners" class. The publication was also distributed to attendees at the Kentucky Association of Realtors Conference in 2005. One realtor has since requested additional copies.

  "*Guide to Onsite Wastewater and New Construction*" is a brochure targeting builders, bankers, and realtors. The brochure outlines Kentucky's application and permit process for onsite wastewater disposal.

  "*So, You Want to Build a House*" is a homeowner brochure outlining Kentucky's application and permitting process for home sewage systems.

Both of these brochures were originally developed by the Kentucky Environmental and Public Protection Cabinet and Kentucky Cabinet for Health and Family Services. KOWA worked with these agencies to revise and reprint an additional 5,000 copies of each brochure. These brochures are currently being distributed to target audiences by KOWA through education and public outreach venues, through local health departments, and through these two state agencies.

"*Kentucky On-site Sewage Disposal Systems Regulation, 902 KAR 10:085"* is a full copy of the state regulation in booklet form. Funding was sufficient for a total of 3,500 copies. This publication is currently being distributed to practitioners and other interested audiences through all education and training venues, as well as through local health departments.

All of the above publications are posted on the website, www.kentuckyonsite.org, with viewing, downloading, and printing capabilities.

An instructor's manual, student manual, and PowerPoint presentation for "*Septic 1 – Your Onsite Wastewater Treatment System – A Homeowners Manual*" have been completed and approved. This course is ready for implementation into the public outreach program through appropriate delivery methods to be selected by the KOWA Education Committee.

Additional public outreach materials are in various forms of draft or planned for future development. These are outlined in Appendix C.

- The website, www.kentuckyonsite.org, was upgraded during the grant period to function as a greater resource for individuals seeking wastewater information. It is useful to, and is being used, by both practitioners and the public. The site's content includes publications, demonstration center information, training opportunities, and useful onsite wastewater links including regulatory agencies, system and component manufacturers, and other education resources. The site has recorded 5,863 hits as of November 8, 2007.

- Public outreach activities, via the delivery methods described in the Outreach and Marketing Plan (Appendix C), have been implemented during the grant period, with periodic review and modification. Tools used to deliver information about educational programs and materials, to-date, have included direct mail, the KOWA website, direct (personal) distribution, and distribution through project partners. While practitioner education activities (Tables 1 and 2) and technology demonstration tours (Table 5) may also be deemed as "outreach," Table 3 provides examples of public outreach efforts undertaken during the grant period to directly reach varied audiences.

Table 3. Selected Public Outreach Activities

Date	Organization or Function	Outreach Activity/Purpose
February 2003	Kentucky Association of Milk, Food & Environmental Sanitarians (KAMFES)	Conference Presentation on Onsite Wastewater
Fall 2003	Anderson Co. Community Education	Cooperated w/ organization to present homeowner education class (less than 10 attendees)
2/18-19/04	KAMFES	Conference Presentation on Onsite Wastewater; Training Center Exhibit and Information Booth
March 2004	Kentucky Water & Wastewater Operators Association	Onsite Wastewater Exhibit
5/4-5/04	Kentucky Public Health Association (KPHA)	Exhibit and Information Booth
2004	Bluegrass Community & Technical College System	Various meetings w/ college leadership to educate on project and strengthen partnership
2004	St. Catharine College	Various meetings w/ college leadership to educate on project and strengthen partnership
2004	Department for Public Health (DPH) Environmental Management Branch	Meetings w/ leadership to discuss potential partnerships for benefits to Kentucky
2/4/05	Precast Co. & HD (Mayfield)	Presentation and materials to supplement installer training
2/16/05	Montgomery Co. HD	Presentation and materials to supplement installer training
2/18/05	Jessamine Co. HD	Presentation and materials to supplement installer training
2/23/05	KAMFES	Conference Presentation on Onsite Wastewater
7/13/05	Kentucky Legislature – Natural Resources Subcommittee	Informational presentation on educational programs and training center in partnership w/ Ky. Division of Water & DPH
9/8/05	Bath County Health Department	Homeowner Education class for town of Preston (42 residents; 8 project staff)
9/20/05	Environmental Leadership Group (DPH)	Introduction of Training Center, training availability and homeowner brochure

9/27-28/05	Kentucky Association of Realtors	Onsite Wastewater Exhibit and distribution of homeowner brochure (approx. 300 attendees)
7/20-21/05	Interstate Health Seminar	Training center presentation.
3/30/06	Eastern Ky. University Environmental Health Seminar	Onsite Wastewater Presentation (45 students)
3/30/06	Watershed Steering Committee	Onsite Wastewater Presentation (approx. 25 attendees)
4/27/06	Watershed Group	Onsite Wastewater Presentation (approx. 50 attendees)
Fall 2006	Jessamine Co. HD	Provided supplemental materials for homeowner education program

Activity Assessment and Additional Comments:

The program has focused its public outreach efforts largely on the practitioner audience to-date, and related tools and delivery mechanisms are quite well established. Improvements in outreach and marketing to this audience will include improvements in the variety and type of information to be delivered in the future, such as providing increased technical information, product approvals, etc. to practitioners. Improvements in electronic delivery will also occur. This includes creation or expansion of e-mail communications and interactive website features.

Greater attention to public and private sector audiences is needed. Materials, as well as technology demonstrations, are now available for use with these audiences, but time and staffing constraints have hindered a full-scale approach. Increased partnerships with organizations that reach these audiences on a regular basis are essential to program success.

<u>Objective #2</u>. Build a system of technology demonstrations and coordinate with the National Onsite Demonstration Project.

<u>Activity #4 – Installation of Technology Demonstrations</u>

Measures of Success:

- Identify BMP locations according to onsite educational regions.
- Coordinate with the National Onsite Demonstration Project.
- Complete installation of a minimum of fifteen (15) technology demonstrations.
- Track the number of individuals visiting demonstrations, according to the target audience represented.

Milestones:

- Install technology demonstrations at Lawrenceburg training site.

Related Program Requirement:

- Develop a BMP Implementation Plan and submit to the Cabinet for review and approval.

Progress and Accomplishments:

- A BMP Implementation Plan was submitted in 2002 in accordance with 319(h) grant requirements, listing technologies that were likely to be installed during the grant period. The BMP plan received Conditional Approval from the Kentucky Division of Water. It was subsequently revised to reflect agency comments. The BMP Implementation Plan is attached as Appendix B.

- During the grant period alone, 20 onsite wastewater treatment and disposal technologies were installed at the Kentucky Onsite Wastewater Training Center located in Lawrenceburg, Kentucky (Table 4). These system and component displays provide target audiences with sound information on available technology, allowing them to select the appropriate BMP (Best Management Practice) for a given site, as well as properly install and maintain the system. Demonstrations and displays are pictured in figures 2 through 21.

  Demonstrations at the training center are “clean-water” demonstrations, thus wastewater monitoring is not required.

Table 4. Technology Demonstrations and Displays
Kentucky Onsite Wastewater Training Center, Lawrenceburg, Kentucky

Technology	**Type of Demonstration (Reference App. B – BMP Implementation Plan)**
Zabel SCAT Advanced Treatment Module (Fig. 2)	Waterloo Biofilter
Eljen Xpandable Chamber & In-drain Display (Fig. 3)	Component Example – Conventional System Troubleshooting Demonstration
Gribbins Whirlair Aeration Unit (Fig. 4)	Aerobic (Domestic Package Plant)
FAST® Wastewater Treatment System (Fig. 5)	Aerobic (Domestic Package Plant)
Zoeller Fusion Cell ZF 450 Treatment System (Fig. 6)	Aerobic (Domestic Package Plant)
Netafim Drip Irrigation Treatment System (Fig. 7)	Additional contribution received during grant period; not originally anticipated at time of BMP Plan development.
Geoflow Drip Irrigation Treatment System (Fig. 8)	Additional contribution received during grant period; not originally anticipated at time of BMP Plan development.
Chromoglass Batch Reactor A-5 SBR (Fig. 9)	Aerobic (Domestic Package Plant)
Puraflo® Peat Filter (Fig. 10)	Peat System
500 gal. Rochester Pump Tank (Fig. 11)	Septic and Pump Tank Display
1000 gal Premier Tech Septic Tank (Fig. 12)	Septic and Pump Tank Display
1500 gal. Norwesco 2-compartment Septic Tank (Fig. 13)	Septic and Pump Tank Display
1500 gal. Fralo 2-compartment Septic Tank (Fig. 14)	Septic and Pump Tank Display
Simplex Grinder Display (Fig. 15)	Pump and Control Systems
Automatic Siphon Display (Fig. 16)	Septic and Pump Tank Display (siphon tank principles)
Conventional Trench Display (Fig. 17)	Conventional System Troubleshooting Demonstration
Gravelless Pipe Display (Fig. 18)	Gravelless Pipe Distribution System
Incinolet Electric Incinerating Toilet (Fig. 19)	Water Conservation
Excel Self-Contained Composting Toilet (Fig. 20)	Water Conservation
Eloo System (Fig. 21)	Water Conservation

Figure 1. SCAT Advanced Treatment Module

Figure 2. Eljen In-drain Display

Figure 3. Gribbins Whirlair Aeration Unit

Figure 4. FAST® Wastewater Treatment System

Figure 5. Zoeller Fusion Cell

Figure 6. Netafim Drip Irrigation System

Figure 7. Geoflow Drip Irrigation System

Figure 8. Chromoglass Batch Reactor

Figure 9. Puraflo® Peat Filter

Figure 10. Rochester Pump Tank

Figure 11. Premier Tech Septic Tank

Figure 12. Norwesco Septic Tank

Figure 13. Fralo Septic Tank

Figure 14. Simplex Grinder

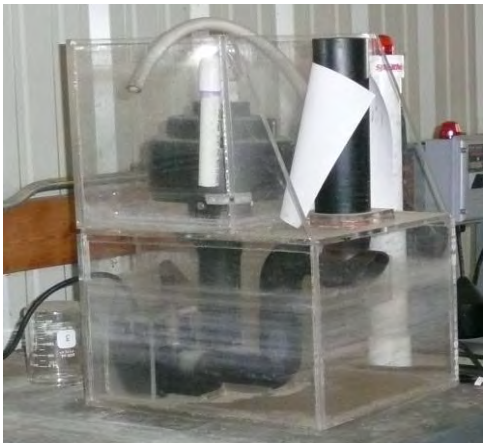

Figure 15. Siphon Display

Figure 16. Conventional Trench

Figure 17. Gravelless Pipe Display

Figure 18. Incinolet Electric Incinerating Toilet

Figure 19. Excel Composting Toilet

Figure 20. Eloo System

In addition to these systems, onsite industry manufacturers and distributors contributed numerous additional components and supplies. Some of the components contributed were used to complete "in-ground" displays (i.e. concrete septic tanks, risers, lids, etc.) Others are small items on display and are suitable for use in training sessions or demonstration tours (i.e. septic tank filters, Prototek Septic Tank Locator, Jiffy Junction Alarm/Pump Control).

Installation of technology is an ongoing activity as components or systems become available from industry manufacturers or distributors. As a result of work and contacts made during the grant period, three additional systems are committed for 2008. These include an EZ Flow Soil Absorption Demonstration, Zaring Septic & Drain (Aerobic System), and Hoot Aerobic System. A concrete tank will be added to the Septic and Pump Tank Display as well. Appendix C contains an overview of all demonstrations currently in place at the Kentucky Onsite Wastewater Training Center, including those completed under this project, and extending the range of technologies outlined in the BMP Implementation Plan. In time, KOWA anticipates the Center will feature one or more examples of each type of treatment demonstration or display described in the original BMP Plan or other technologies that may become future options for Kentucky.

- A site map, including existing demonstrations, was prepared in 2006 as a planning tool for program developers. The site map is attached in Appendix D.

- Technology demonstration information, including location and driving directions, was added to the website during the grant period.

- Total recorded attendance to the demonstration site during the grant period was 870. This includes 716 attendees at practitioner classes held at the training center (Table 1) and a minimum of 154 individuals participating in additional tours listed in Table 5 below. However, it does not include "self-guided" tours, as there is no method for tracking independent visits to the site. The site is accessible to the public year-round.

Table 5. Technology Demonstration Tours
(other than formal trainings listed in Table 1)

Date	Organization or Function	Outreach Activity/Purpose
4/24/04	Kentucky Geological Society	Presentation and Training Center Tour
6/10/04	Knox Co. Management Committee	Training Center Tour
2004	Bluegrass Community & Technical College	Training Center Tour (2 administrators)
3/31/05	Kentucky Infrastructure Authority, Ky. Division of Water, Area Development Districts	Training Center Tour (23 attendees)
5/14/05	Jessamine Co. Local Government	Training Center Tour
7/19/05	Zoeller Pump Company	Training Center Tour
9/30/05	KOWA Staff/Homeowner	Tour/in-house training (4 staff/volunteers, 1 homeowner)
11/2/05	Environmental Leadership Group (DPH and others)	Training Center Tour and Presentation on education efforts (35 attendees)
4/11/06	Jessamine Co. Private Sector Reps	Training Center Tour (2 developers, 1 engineer)
4/12/06	Sayre High School AP Environmental Class	Training Center Tour (33 students)
3/2/07	Certified Installer	Tour for technology review related to problem site (1)
9/14/06	Department for Public Health	Provided Tour as part of new regulator training (14)
3/22/07	Department for Public Health	Provided Tour as part of new regulator training (8)
5/24/07	Department for Public Health	Provided Tour as part of new regulator training (10)
9/7/07	Department for Public Health	Provided Tour as part of new regulator training (15)
8/14/07	Loyd Realty Group	Training Center Tour (6 realtors)

Activity Assessment and Additional Comments:

While the original BMP plan provides guidance for technology demonstrations to be incorporated at the demonstration site, it is evident that it is not all-inclusive of existing and available onsite technologies. Program developers recognize that additional technologies, both currently in use in Kentucky or technologies to be developed or approved in future, are also appropriate for inclusion as onsite technology demonstrations.

Program developers originally considered the integration of three additional regional sites in Kentucky. Acquisition, operation, and maintenance of additional sites is not feasible at this time due to staffing needs, utility and maintenance costs, and security issues.

The original workplan referenced coordination with the National Onsite Demonstration Project (NODP). Project staff acquired and utilized NODP materials in curriculum development; however, coordination in terms of demonstrations did not occur. The NODP has a limited number of "functioning" demonstrations in place at various locations in the U.S. These are technologies installed to resolve specific wastewater disposal problems, while monitoring and evaluating the system to determine its effectiveness. Technologies installed at the Kentucky Onsite Wastewater Training Center are intended for education and outreach purposes, primarily to demonstrate the wide array of technologies available in the market and the importance of technology selection based on site conditions. As the two programs differ in purpose, coordination is unnecessary.

Increased utilization of the technology demonstration site will occur as the education and public outreach programs expand, as additional partnerships with related audiences are created, and as the onsite industry in Kentucky changes. Current and future utilization of the demonstration site, building on current efforts described in this report, are outlined on page 52 of Appendix C.

<u>Objective #3</u>. Develop and implement a monitoring and assessment plan for overall program effectiveness.

<u>Activity #6 – Program Monitoring & Assessment</u>

Measures of Success:

1. Conduct follow-up surveys of all training participants.
2. Complete a plan for sustainability after closing of project funds.
3. Develop index of industry professionalism and measure health of the industry. (For example, new products being introduced; number of alternative systems v. conventional; cost or profit per job; research expenditures may be used in measuring the health of the industry.)
4. Pre- and post-project surveys of local health departments to measure project impacts. (i.e., permits issued; operation and maintenance requirements by county; failing systems; etc.)

Milestones:

a. Develop evaluation plan
b. Implement evaluation plan

Progress and Accomplishments:

- Post-class evaluations of training participants were conducted on a regular basis during early training efforts and randomly in 2006 and 2007. A copy of the evaluation form is attached in Appendix D.

- A sustainability plan for the program has been outlined and is included in Appendix C.

- Trainings held across the state, "off-site" from the Kentucky Onsite Wastewater Training Center, were implemented in cooperation with local health departments and community colleges. These cooperators were instrumental in reaching the target practitioners on a local level and in assisting KOWA in increasing the number of trainings held statewide. Program effectiveness can be measured to some extent by repeat cooperation of the local organizations. In 2006, 15 cooperators partnered with KOWA to provide local trainings. In 2007, 13 of the same (87%) repeated the partnership and three new cooperators participated. This data provides indication that the project has positive local impacts.

- An evaluation plan for the model education program has been developed and is included in Appendix C.

- Various elements of the evaluation plan have been implemented and can be used as indicators for program continuance. Additional elements must be implemented as the program continues and expands.

Activity Assessment and Additional Comments:

Class evaluations were intended to provide project leadership with insight for program improvement, but in reality yielded little information. Instructors, classes, facilities, etc. were commonly all rated excellent by practitioners, with little or no feedback provided. Project leadership feels this is largely due to the lack of value placed on onsite practitioner education, both from practitioners themselves and the infrastructure that has existed in Kentucky since the inception of a state-mandated educational requirement.

The original workplan called for two evaluation measures that were not fully completed during the grant period. Both addressed the onsite industry in Kentucky as a whole. Project leadership feels these measures are beyond the scope of the project, as results would be skewed by many other factors. Such factors primarily relate to the regulatory environment, at both state and local levels. It would be impossible to determine project effectiveness in the current arena. Project developers feel the evaluation plan that has been developed will provide a more accurate assessment of program effectiveness.

Actual monitoring and assessment of the project has been "product-based" including completion of public outreach materials, curriculum materials, tracking of program participation, partnerships developed, and installation of demonstration systems. Data gathered is assessed under the discussion of each of these activities.

Conclusions and Recommendations

Overall, and as discussed in the "Results" section of this final report, the project met, and often exceeded, stated milestones and measures of success for each activity. Discussion of all individual activities in the previous section included assessment and specific recommendations for continued improvement of project activities. Earlier discussion shows that project activities, in general:

- Reached the target audiences
- Provided benefits to practitioners
- Focused on proper wastewater disposal
- Provided access to BMPs and stressed use of appropriate technology for wastewater disposal

More importantly though, successful completion of activities enabled the project to attain its major objectives:

- Development and implementation of statewide training to practitioners, public sector, and private sector audiences
- Provision of a system of technology demonstrations
- Continual assessment for program improvement

Accomplishment of objectives assisted the project in progressing toward its primary goal, *the establishment of an effective system of education that will provide needed training and outreach to all parties essential to solving onsite wastewater problems.* In turn, the project addressed onsite wastewater disposal as nonpoint source pollution and was an appropriate "fit" with state and federal nonpoint source pollution initiatives and goals. Success of individual project activities integral to the overall program indicates that the primary goal is an achievable one. Indeed, the goal remains an appropriate one on which to base the program in the future. Accomplishments during the grant period will enable to program to continue meeting goals and objectives in the long-term. For example,

- Partnerships involving more than 45 organizations, agencies and businesses were formed during the project. These partnerships will allow continued sharing of resources, maximizing available time and dollars spent in addressing onsite wastewater disposal as an NPS pollution concern.

- In excess of a recorded 10,000 individuals were reached with initial onsite wastewater disposal and NPS information, creating a knowledge base among the target audience that opens the door for future acceptance of ideas and concepts.

- A library of materials was accumulated and/or produced during the grant period. These materials can continue to be utilized in cost-effective ways to address program goals and objectives.

- A model program was drafted as a future base of cooperation between state agencies and onsite industry. The grant period was truly a "pilot project." It allowed the testing of a model onsite education and outreach program for Kentucky, one that can be built upon or modified for formal adoption by the state.

- The KOWA organization was elevated among the onsite industry and the public as a leading resource for onsite wastewater information. The ability of the organization to act as a "clearinghouse" of information among practitioners, as well as the public and private sectors, signals its capacity to coordinate long-term education and outreach programs.

During the course of implementing this "pilot project," leadership encountered two significant impediments. While these impediments did not prevent activities from proceeding, they did slow the progress of the project and, as a result, possibly reduced specific outcomes or results of the project. In other words, although measures of success and milestones were met and/or exceeded, the results could have been greater.

Personnel issues hindered completion of activities and created a need to extend the grant timeline from the original 3-year period to a 5-year period. Leadership relied on both paid staff and volunteers for completion of activities. While volunteers were extremely important to the project in terms of expertise, labor, and costs, it was difficult to obtain commitments and ensure completion of assignments. As a result of managing and restructuring personnel and assignments during the course of the project, KOWA leadership learned the value of ensuring adequate staffing, clear assignment of responsibilities, and accountability for completion of assignments. Leadership also learned the value of early recognition of problems that might hinder activity accomplishment, as well as the need for prompt resolution to ensure timelines are met.

The second impediment encountered during the course of the project revolved around the perceived value of practitioner education in the state. Many practitioners themselves place little or no value on installer education at this time. Leadership found that, in many cases, this holds true for the regulatory environment. While some practitioners see a purpose for education in terms of a changing onsite industry and potential business or personal growth, the current education system in the state does not produce perceptions of value. Perceived value of education occurs when education is both meaningful and useful to achieving personal goals. Leadership found however, in conducting practitioner training, that practitioners are more receptive to programs that provide new or high-quality information that is "usable." This indicates that a vital onsite education system will provide value to the user, the practitioner, rather than just fulfill an annual regulatory requirement.

Based on its experiences and assessments to-date, project leadership provides the following recommendations for continued progress of the program:

1. Modification and improvement of individual activities as described in the "Results" section, including periodic assessment of those activities

2. Increased focus on the public and private sectors
3. Improved personnel planning, including adequate staffing and appropriateness of assignments
4. Creation of working partnerships between industry leadership and the state's onsite regulatory agencies to determine and establish an appropriate education infrastructure, including long-range vision, implementation, and sustainability
5. Increased dialogue with the Department for Public Health to facilitate evaluation and approval of new or innovative onsite technologies in Kentucky, increasing the range of disposal options available to landowners

During the course of the project, two endeavors by KOWA will assist project leadership in taking action to fulfill the above recommendations. First, KOWA has collaborated with the Kentucky Rural Water Association (KRWA) for organizational management. This partnership will extend program resources, including training and outreach capabilities, as well as personnel capabilities. Second, the draft Education Program Manual (Appendix C) will be an important tool in creating a formal onsite education infrastructure in Kentucky. As such, it provides the basis for creation of the needed working partnerships.

From the outset, the Kentucky Wastewater Education Project was not designed as a program to be viewed in the short-term. Grant funding provided only the means for initial establishment of the program and an opportunity to create awareness of the project among the various target audiences. As grant funding is phased out, the project will continue through the efforts of the onsite industry. In the long-term, the project will become self-sustaining, a result of cooperation between the partners and individuals involved. Industry professionals will seek to remain involved in a project continually adapting to meet changing needs across the state. Installers, service professionals, and others will seek training to achieve higher level individual and business goals. The Kentucky Wastewater Education Project will continue to evolve into an "institution" for the state onsite industry, bringing all participants to a common table, providing answers to age-old problems, and setting new standards for onsite training and knowledge. The result is a permanent solution to addressing and reducing onsite wastewater problems, a recognized contributor to nonpoint source pollution in Kentucky.

The Kentucky Wastewater Education Project implemented by KOWA has the potential to provide needed solutions for onsite wastewater concerns in relation to nonpoint source pollution. While the project remains an imposing endeavor, the need and timeliness of onsite education is unquestionable. Through coordination of resources and strengthening of new and existing partnerships, the Kentucky Wastewater Education Project can be a vital program in achieving Kentucky's water quality goals.

Literature Cited

1. Consortium of Institutes for Decentralized Wastewater Treatment. 2007. *CIDWT Decentralized Wastewater Glossary.*

2. Kentucky Environmental and Public Protection Cabinet. 2006. *Integrated Report to Congress on Water Quality in Kentucky*. Volume I. 305(b). Division of Water, Frankfort, Kentucky.

3. Kentucky Environmental Quality Commission. 1999. *Onsite Sewage in Kentucky*. Frankfort, Kentucky.

4. U.S. Environmental Protection Agency. 1997. *Response to Congress on Use of Decentralized Wastewater Treatment Systems.* EPA 832-R-97-001B. Office of Water, Office of Wastewater Management, Washington DC.

5. U.S. Environmental Protection Agency. 2002. *Kentucky Straight Pipes Report*. Region 4.

6. U.S. Environmental Protection Agency. 2003. *Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems*. EPA 832-B-03-001. Office of Research and Development, Office of Water, Washington DC.

7. U.S. Environmental Protection Agency. 2005. *Decentralized Wastewater Treatment Systems: A Program Strategy*. EPA 832-R-05-002. Office of Water, Washington DC.

Kentucky Wastewater Education Project
Financial & Administrative Closeout

Project Outputs:

Product	Completion Date
<u>*Training Course Manuals*</u> An Instructor's Manual and Student Manual for each of the following courses:	

SEPTIC 1: Your Onsite Wastewater Treatment System- A Homeowner's Manual	February 2006
ONSITE 101: Introduction to Soils and Site Evaluation	March 2007
ONSITE 110: Septic Tanks and Effluent Filters	March 2007
ONSITE 140/141: Introduction to Wastewater Microbiology & Chemistry	September 2007
DESIGN 099: Basic Conventional Onsite Wastewater Treatment System Design	March 2007
DESIGN 202: Low-Pressure Piping Systems	March 2007
ATS 100/101: Onsite Wastewater Technology Overview	October 2003 Revised August 2006
O&M 204: Composting Operations	March 2007
O&M 205: Land Application Operations	June 2007
Public Outreach Materials	
"A Kentucky Homeowner's Guide to Septic Systems"	August 2005 (5,000) Revision - December 2006 (10,000)
"Guide to Onsite Wastewater and New Construction" (reprinting of existing brochure)	December 2006 (5,000)
"So, You Want to Build a House" (reprinting of existing brochure)	December 2006 (5,000)
"Kentucky On-site Sewage Disposal Systems Regulation, 902 KAR 10:085" (printing of actual regulation)	December 2003 (500) October 2004 (1,000) December 2006 (2,000)
Program Guidance Document	
Kentucky Wastewater Education Program Manual	September 2007 (Working Draft)

Project Outputs (cont'd):

Product	Completion Date
Technology Demonstrations	
Zabel SCAT Unit Zabel SCAT 200 Advanced Treatment Module	December 2002 May 2004 (new model)
Eljen Xpandable Chamber & In-drain Display	December 2002
Gribbins Whirlair Aeration Unit	October 2003 (new model)
FAST® Wastewater Treatment System	June 2003
Zoeller Fusion Cell ZF 450 Treatment System	December 2006
Netafim Drip Irrigation Treatment System	May 2004
Geoflow Drip Irrigation Treatment System	January 2005
Chromoglass Batch Reactor A-5 SBR	June 2005
Puraflo® Peat Filter (Cell #2)	November 2003
500 gal. Rochester Pump Tank	December 2003
1000 gal Premier Tech Septic Tank	November 2003
1500 gal. Norwesco 2-compartment Septic Tank	April 2004
1500 gal. Fralo 2-compartment Septic Tank	May 2005
Simplex Grinder Display	November 2003
Automatic Siphon Display	November 2003
Conventional Trench Display	September 2007
Gravelless Pipe Display	September 2007
Incinolet Electric Incinerating Toilet	November 2003
Excel Self-Contained Composting Toilet	November 2003
Eloo System	August 2006

DETAILED BUDGET SUMMARY **12/18/2007**

Budget Categories	Section 319(h)			Non-Federal Match			TOTAL		
	Orig Bdgt	Mod Bdgt	Actual	Orig Bdgt	Mod Bdgt	Actual	Orig Bdgt	Mod Bdgt	Actual
Personnel	**219909.00**	**219909.00**	**198659.25**	**102469.00**	**64000.00**	**66857.97**	**322378.00**	**283909.00**	**265517.22**
BMP Implementation	27200.00	37200.00	25792.26	22800.00	25000.00	16909.25	50000.00	62200.00	42701.51
Project Management	80000.00	50000.00	38752.66	34000.00	12000.00	18492.57	114000.00	62000.00	57245.23
Education	98427.00	123427.00	134114.33	39951.00	25000.00	31456.15	138378.00	148427.00	165570.48
Program Monitoring	10000.00	5000.00	0.00	0.00	0.00	0.00	10000.00	5000.00	0.00
Technical Assistance	4282.00	4282.00	0.00	5718.00	2000.00	0.00	10000.00	6282.00	0.00
Supplies	**40924.00**	**40000.00**	**33381.65**	**26902.00**	**19000.00**	**7948.75**	**67826.00**	**59000.00**	**41330.40**
BMP Implementation	0.00	5000.00	4562.74	5000.00	12000.00	4958.55	5000.00	17000.00	9521.29
Project Management	0.00	0.00	0.00	5000.00	1000.00	1417.03	5000.00	1000.00	1417.03
Education	40924.00	35000.00	28818.91	11902.00	5000.00	1573.17	52826.00	40000.00	30392.08
Program Monitoring	0.00	0.00	0.00	5000.00	1000.00	0.00	5000.00	1000.00	0.00
Equipment	**20000.00**	**35218.00**	**26475.60**	**50000.00**	**81500.00**	**98615.05**	**70000.00**	**116718.00**	**125090.65**
BMP Implementation	0.00	3000.00	0.00	30000.00	80000.00	68020.86	30000.00	83000.00	68020.86
Project Management	10000.00	10000.00	4475.60	0.00	0.00	0.00	10000.00	10000.00	4475.60
Education	10000.00	22218.00	22000.00	20000.00	1500.00	30594.19	30000.00	23718.00	52594.19
Travel	**24794.00**	**10500.00**	**9187.70**	**5680.00**	**11800.00**	**15351.79**	**30474.00**	**22300.00**	**24539.49**
BMP Implementation	3460.00	2000.00	346.10	600.00	5000.00	4180.53	4060.00	7000.00	4526.63
Project Management	14926.00	6000.00	6706.36	1080.00	3800.00	6089.92	16006.00	9800.00	12796.28
Education	6408.00	2000.00	2135.24	1000.00	2000.00	5081.34	7408.00	4000.00	7216.58
Program Monitoring	0.00	0.00	0.00	1000.00	500.00	0.00	1000.00	500.00	0.00
Technical Assistance	0.00	500.00	0.00	2000.00	500.00	0.00	2000.00	1000.00	0.00
Contractual	**10200.00**	**10200.00**	**4417.00**	**15000.00**	**15000.00**	**0.00**	**25200.00**	**25200.00**	**4417.00**
BMP Implementation	0.00	5000.00	3442.00	15000.00	10000.00	0.00	15000.00	15000.00	3442.00
Education	10200.00	5200.00	975.00	0.00	5000.00	0.00	10200.00	10200.00	975.00
Operating Costs	**0.00**	**0.00**	**0.00**	**6000.00**	**12000.00**	**18106.00**	**6000.00**	**12000.00**	**18106.00**
Project Management	0.00	0.00	0.00	6000.00	12000.00	18106.00	6000.00	12000.00	18106.00
Other	**0.00**	**0.00**	**0.00**	**4500.00**	**7251.00**	**8286.12**	**4500.00**	**7251.00**	**8286.12**
BMP Implementation	0.00	0.00	0.00	2500.00	2700.00	475.87	2500.00	2700.00	475.87
Project Management	0.00	0.00	0.00	2000.00	4551.00	7810.25	2000.00	4551.00	7810.25
TOTAL	**315827.00**	**315827.00**	**272121.20**	**210551.00**	**210551.00**	**215165.68**	**526378.00**	**526378.00**	**487286.88**
	60%	*60%*	*56%*	*40%*	*40%*	*44%*	*100%*	*100%*	*100%*

Orig Bdgt = original workplan budget *Mod Bdgt = modified budget 8/2004* *Actual =actual project expenditures*

Remaining (excess) Project Funds:

Total Grant Funds Allocated	**$315,827.00**
Total Grant Funds Reimbursed	**292,372.14**
Remaining (excess) Funds	**$ 23,454.86**

KOWA recommends reallocation of excess funds for onsite wastewater training – instructor/leadership professional development. Excess funds could be utilized to increase teaching competencies and knowledge of instructors and program leaders in onsite wastewater topics.

Equipment Purchases:

Video-Conferencing Equipment (Polycom Viewstation/Vtel Vista) 1/ 2/
Toshiba Laptop System #PSM50U-ON80 (including components and software)
Hewlitt Packard Inkjet Printer
Digital Camera Kit/Memory Card
Extension Cords/Surge Protectors
Epson Powerlite LCD Projectors (2)
Memorex 2 GB USB 2.0 TravelDrive
Altec Lansing 2.1 Speaker System
Targus Wireless Presentation Remote
Canon MF6550 Copier/Printer

Notes:

1/ Current, per-unit fair market value of the video-conferencing equipment exceeds $5,000. The original cost of the equipment was $50,000, of which grant funds in the amount of $22,000 were expended. The remaining $28,000 of the cost was contributed by the Bluegrass Community & Technical College. The video-conferencing equipment was purchased in accordance with the project workplan to develop the capacity for long-distance training and outreach.

The combined purchase price of all remaining equipment was less than $5,000 and the current, per-unit fair market value of the remaining items is less than $5,000.

2/ KOWA plans to retain the equipment in order to use it for its original purposes by instituting long-distance training and public outreach. At such time in the future when this equipment may no longer be needed for the Kentucky Wastewater Education Project or other federally-supported activity, KOWA will follow disposition procedures per 40 CFR Part 31.32 for equipment purchased in part with grant funds. If the per-unit fair market value of the equipment at that time is less than $5,000, KOWA may dispose of the equipment with no further obligation to the agency. If the market value of the equipment at that time exceeds $5,000, KOWA will contact the agency for disposition instructions.

KENTUCKY WASTEWATER EDUCATION PROJECT

BEST MANAGEMENT PRACTICES (BMP) IMPLEMENTATION PLAN

October 18, 2002

Revised per DOW Conditional Approval and Comments 1/14/03

Grant #C9994861-01

Kentucky Onsite Wastewater Association
P.O. Box 253
Springfield, KY 40069

BMP IMPLEMENTATION PLAN

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CONVENTIONAL CONSTRUCTED WETLAND
Subsurface Flow

Financial Plan of Action:

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Framing Materials
    - Hardware (screws, nails, fasteners)
    - Gravel and Sand
    - Liner
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Wetland plants
    - Grass seed/Straw
- Estimated Cost of Training Center Installation:
  - Framing Materials $ 150.00
  - Hardware $ 25.00
  - Gravel $ 450.00
  - Sand $ 100.00
  - Liner $ 380.00
  - Piping $ 150.00
  - Wetland Plants $ 200.00
  - Grass seed/Straw $ 30.00
  - Installation $1200.00

TOTAL:
$2685.00

- Estimated Cost of Installation for Homeowner

  The cost of a wetland system to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $8,000 - $15,000, which would include installation, septic tank, tank filter, pump tank, pumps and controls, wetland construction materials, plants, electrical installation and soil absorption field.

- Typical Operation and Maintenance Annual Cost: $100-200/ Year for wetland plant maintenance and replanting, tank pumping, system inspection, and electrical cost.

- Installation description

  The Conventional Subsurface Flow Wetland (CSFW) will be constructed next to the existing Up-flow Wetland Z-cell and utilize the existing septic tank and pump. Additional piping will be needed to make connection to water source. The CSFW will be 8' width X 16' length X 2' deep.

- Pollution Control Relative Efficiency

  The efficiencies listed below were compiled from the following sources:

  1. Byers, M.E. et al, Efficiency of Homeowner Managed Constructed Wetlands for Onsite Wastewater Treatment in Kentucky.
  2. Crites and Tchobanoglous Small and Decentralized Wastewater Management Systems, McGraw-Hill 1998.
  3. Davis, Mike et al, Ongoing Study of the Kentucky State University Research Station Wetland treatment System.
  4. Constructed Wetlands General Information Technology Package, WWBKGN54 National Small Flows Clearinghouse.
  5. Subsurface Flow Constructed Wetland for Wastewater Treatment: A Technology Assessment, WWBKDM74, National Small Flows Clearinghouse.

Removal Efficiency

o Ammonia Removal:	20-80%
o Biochemical Oxygen Demand Removal:	60-90%
o Fecal Coliform Removal:	60-90%
o Total Coliform Removal:	60-90%
o Total Nitrogen Removal:	40-90%

- Total Suspended Solids Removal: 60-90%
- Phosphorus Removal: 40-90%

The above range of efficiencies can be expected due to variations at the individual installation based on: waste strength, cell design, media type and size, hydraulic loading (detention time), operations and maintenance, and ambient weather conditions at the location of installation.

- Inspection, Operation and Maintenance Requirements
    - Pumps and floats must be checked at least once a year.
    - Wetland cell plants must be pruned or harvested each fall.
    - Wetland cell plants must be replanted, as needed, but usually each spring.
    - Wetland cell must be inspected for damage each year.
    - Wetland cell must be inspected for buildup of organic material and cleaned as necessary.
    - Pump and/or septic tank filters must be inspected and cleaned each year.
    - Pump and/or septic tanks must be inspected each year and pumped every 3 to 5 years.

- BMP Target:
    - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END CONVENTIONAL CONSTRUCTED WETLAND

DOSED/RE-CIRCULATING CONSTRUCTED WETLAND
Subsurface Flow

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Framing Materials
    - Hardware (screws, nails, fasteners)
    - Gravel and Sand
    - Liner
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Wetland plants
    - Grass seed/Straw
- Estimated Cost of Training Center Installation:
  - Framing Materials $ 150.00
  - Hardware $ 25.00
  - Gravel $ 450.00
  - Sand $ 100.00
  - Liner $ 380.00
  - Piping $ 150.00
  - Wetland Plants $ 200.00
  - Grass seed/Straw $ 30.00
  - Installation $1200.00

TOTAL:
$2685.00

- Estimated Cost of Installation for Homeowner
    - The cost of a re-circulating wetland to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $8,000 - $15,000, which would include installation, septic tank, tank filter, pump tank, pumps and controls, wetland construction materials, plants, electrical installation and soil absorption field.
- Typical Operation and Maintenance Annual Cost: $100-200/ Year for wetland plant maintenance and replanting, tank pumping, system inspection, and electrical cost.

- Installation description

  The Dosed/Re-circulating Subsurface Flow Wetland (DRSFW) will be constructed next to the existing Up-flow Wetland Z-cell and utilize the existing septic tank and pump. Additional piping will be needed for connection to the water source. The DRSFW will be 8' width X 16' length X 2' deep.

- Pollution Control Relative Efficiency

  The efficiencies listed below were compiled from the following sources:

1. Byers, M.E. et al, Efficiency of Homeowner Managed Constructed Wetlands for Onsite Wastewater Treatment in Kentucky.
2. Byers, M.E., Personal Contact.
3. Crites and Tchobanoglous Small and Decentralized Wastewater Management Systems, McGraw-Hill 1998.
4. Davis, Mike et al, Ongoing Study of the Kentucky State University Research Station Wetland Treatment System.
5. Constructed Wetlands General Information Technology Package, WWBKGN54 National Small Flows Clearinghouse.
6. Subsurface Flow Constructed Wetland for Wastewater Treatment: A Technology Assessment, WWBKDM74, National Small Flows Clearinghouse.

Removal Efficiency

o Ammonia Removal:	20-80%
o Biochemical Oxygen Demand Removal:	60-90%
o Fecal Coliform Removal:	60-90%

- Total Coliform Removal: 60-90%
- Total Nitrogen Removal: 40-90%
- Total Suspended Solids Removal: 60-90%
- Phosphorus Removal: 40-90%

The above range of efficiencies based on conventional constructed wetlands can be expected due to variations at the individual installation based on: waste strength, cell design, media type and size, hydraulic loading (detention time), operations and maintenance, and ambient weather conditions at the location of installation. The recirculation and dosing of the system typically result in an overall increase in removal efficiencies of 20-40%.

- Inspection, Operation and Maintenance Requirements

    - Pumps and floats must be checked at least once a year.
    - Wetland cell plants must be pruned or harvested each fall.
    - Wetland cell plants must be replanted, as needed, but usually each spring.
    - Wetland cell must be inspected for damage each year.
    - Wetland cell must be inspected for buildup of organic material and cleaned as necessary.
    - Pump and/or septic tank filters must be inspected and cleaned each year.
    - Pump and/or septic tanks must be inspected each year and pumped every 3 to 5 years.

- BMP Target:

    - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END DOSED/RE-CIRCULATING WETLAND

MOUND SYSTEM

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Hardware (screws, nails, fasteners)
    - Fabric
    - Gravel
    - Sand
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass Seed/Straw
- Estimated Cost of Training Center Installation:
  - Hardware $ 25.00
  - Fabric $ 50.00
  - Gravel $ 250.00
  - Sand $ 500.00
  - Piping $ 200.00
  - Grass seed/Straw $ 30.00
  - Installation $1500.00

TOTAL: $2555.00

- Estimated Cost of Installation for Homeowner

The cost of construction for a mound system to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $8,000 - $15,000, which would include installation, septic tank, tank filter, pump tank, pumps and controls, mound system construction materials, and electrical installation.

- Typical Operation and Maintenance Annual Cost: $100-200/ Year for mound maintenance, tank pumping, system inspection, and electrical cost.

- Installation description

  The Mound System will be constructed next to the existing peat systems and utilize the existing septic tank and pump. Additional piping will be needed for connection to the water source. The Mound System will be approximately 15' width X 20' length X 5' high.

- Pollution Control Relative Efficiency

  The mound system was developed for use on sites where unsuitable conditions exist. Such factors as limited soil depth, unsuitable soil types, limited depth to restrictive horizons, high water table etc. utilize the mound system to replace the natural treatment ability of suitable soil. The system design is based on typical domestic wastewater which as been pretreated by passing through a septic tank and has biochemical oxygen demand in the range of 150-250 mg/L and total suspended solids in the range of 50-150 mg/L. Highly pretreated waste such as those from peat systems, re-circulating sand filters, etc. will allow for a higher loading rate on the system. Wisconsin currently has over 30,000 mound systems in place will a success rate of over 95%.

  1. Wisconsin Mound Soil Absorption System Siting, Design and Construction Manual and Pressure Distribution Network Design, WWBKDM09.

  2. Sand Mound Technology Package, WWBKGN76, National Small Flows Clearinghouse.

  3. Mound Systems, WWWFSOM27, National Small Flows Clearinghouse.

     - Fecal Coliform Removal: 40-90%
     - Total Coliform Removal: 40-90%
     - Total Nitrogen Removal: 40-90%

The above range of efficiencies can be expected due to variations at the individual installation based on: waste strength, mound design, media type and size, hydraulic loading (detention time), operations and maintenance, and ambient weather conditions at the location of installation.

- Inspection, Operation and Maintenance Requirements

  - Pumps and floats must be checked at least once a year.

- Grass must be mowed and maintained.
- Pump and/or septic tank filters must be inspected and cleaned each year.
- Pump and/or septic tanks must be inspected each year and repaired as needed.
- Calibrate pumps and meters each year.

- BMP Target:
  - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END MOUND SYSTEM

RE-CIRCULATING SAND FILTER

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Framing Materials
    - Hardware (screws, nails, fasteners)
    - Gravel and Sand
    - Liner
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass seed/Straw
    - Pump
    - Pump Controls
    - Electrical components
    - Septic/Pump Tank
- Estimated Cost of Training Center Installation:
  - Framing Materials $ 150.00
  - Hardware $ 25.00
  - Gravel $ 250.00
  - Sand $ 700.00
  - Liner $ 400.00
  - Piping $ 300.00
  - Grass seed/Straw $ 30.00
  - Installation $1500.00

TOTAL:
$3355.00

- Estimated Cost of Installation for Homeowner

  The cost of construction for a re-circulating sand filter to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $8,000 - $15,000, which would include installation, septic tank, tank filter, pump tank, pumps and controls, re-circulating sand filter construction materials, electrical installation, and soil absorption field.

- Typical Operation and Maintenance Annual Cost: $100-200/ Year for maintenance, operation, tank pumping, system inspection, and electrical cost.

- Installation description

  The Re-circulating Sand Filter (RSF) will be constructed next to the existing re-circulating gravel filter and utilize the existing septic tank and pump. Additional piping will be needed for connection to the water source. The RSF will be 8' width X 8' length X 4' deep.

- Pollution Control Relative Efficiency

  The efficiencies listed below were compiled from the following sources:

  1. Re-circulating Sand Filters, WWFWOM25, National Small Flows Clearinghouse.

  2. Sand Filter Technology Package, WWBKGN29, National Small Flows Clearinghouse.

  3. Re-circulating Sand/Gravel Filters for On-site Treatment of Domestic Waste, WWBLDM87, National Small Flows Clearinghouse.

Treatment Efficiency

o Biochemical Oxygen Demand Removal:	60-99%
o Fecal Coliform Removal:	60-99%
o Total Coliform Removal:	60-95%
o Total Nitrogen Removal:	10-50%
o Total Suspended Solids Removal:	60-95%
o Total Phosphorous Removal:	20-60%

The above range of efficiencies can be expected due to variations at the individual installation based on: waste strength, cell design, media type and size, hydraulic loading (detention time), operations and maintenance, and ambient weather conditions at the location of installation.

- Inspection, Operation and Maintenance Requirements

- Pumps and floats must be checked at least once a year.
- Grass must be mowed and maintained.
- Pump and/or septic tank filters must be inspected and cleaned each year.
- Pump and/or septic tanks must be inspected each year and pumped as needed. Typically, tanks will need pumping every 3 to 5 years.

- BMP Target:
  - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END RE-CIRCULATING SAND FILTER

PEAT SYSTEM

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Hardware (screws, nails, fasteners)
    - Chambers
    - Peat
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass seed/Straw
    - Pump
    - Pump Controls
    - Electrical components
    - Septic/Pump Tank

- Estimated Cost of Training Center Installation:
  - Hardware $ 25.00
  - Chamber $2000.00
  - Peat $ 500.00
  - Piping $ 150.00
  - Grass seeds/Straw $ 30.00
  - Installation $1500.00

TOTAL: $4205.00

- Estimated Cost of Installation for Homeowner

The cost of a peat system to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $8,000 - $15,000, which would include installation, septic tank, tank filter, pump tank, pumps and controls, peat and peat chamber, electrical installation and soil absorption field.

- Typical Operation and Maintenance Annual Cost: $25-$125/Year for maintenance, operation, tank pumping, system inspection, media replacement, and electrical cost.

- Installation description

  The additional peat system will be constructed next to the existing peat system installations and utilize the existing septic tank and pump. Additional piping will be needed for connection to the water source. Additional systems of the same type of technology allow visitors to the site to view varied products available in the market.

- Pollution Control Relative Efficiency

  The efficiencies listed below were compiled from the following sources:

  1. Solomon, Clement <u>The Use of Peat Filters in Domestic Wastewater Treatment.</u>

  2. Gustafson, David M. et al <u>Innovative Onsite Sewage Treatment System, Peat Filters.</u>

  3. Henry, Hugh et al <u>Treatment of Septic Tank Effluent Using the Puraflo Peat Biofiltration System.</u>

  4. Guite, M et al <u>Performance of Peat Filters in the Treatment of Domestic Wastewater in Minnesota.</u>

     - Ammonia Removal: 60-98%
     - Biochemical Oxygen Demand Removal: 60-98%
     - Fecal Coliform Removal: 60-99%
     - Total Coliform Removal: 60-99%
     - Total Nitrogen Removal: 40-90%
     - Total Suspended Solids Removal: 10-80%
     - Phosphorus Removal: 10-80%

The above range of efficiencies can be expected due to variations at the individual installation based on: waste strength, cell design, media type and size, hydraulic loading (detention time), operations and maintenance, and ambient weather conditions at the location of installation.

- Inspection, Operation and Maintenance Requirements

    - Pumps and floats must be checked at least once a year.
    - Pump and/or septic tank filters must be inspected and cleaned each year.
    - Pump and/or septic tanks must be inspected each year and pumped as needed. Typically, tanks will need pumping every 3 to 5 years.
    - Peat media will need replacement in from seven (7) to fifteen (15) years.

- BMP Target:

    - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END PEAT SYSTEM

AEROBIC (DOMESTIC PACKAGE PLANT) SYSTEM

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Hardware (screws, nails, fasteners)
    - Treatment Unit
    - Gravel and Sand
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass seed/Straw
    - Pump
    - Pump Controls
    - Electrical components
    - Septic/Pump Tank
- Estimated Cost of Training Center Installation:
  - Treatment Unit $12,000.00
  - Hardware $ 25.00
  - Gravel $ 150.00
  - Sand $ 150.00
  - Piping $ 150.00
  - Grass seed/Straw $ 30.00
  - Pump $ 500.00
  - Pump Controls $ 350.00

- Electrical components $ 350.00
- Installation $ 1500.00

TOTAL: $15,205.00

- Estimated Cost of Installation for Homeowner

  The cost of an aerobic treatment system to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $16,000 - $30,000, which would include installation, treatment unit, pump tank, pumps and controls, electrical installation, and soil absorption field.

- Typical Operation and Maintenance Annual Cost: $300-600/ Year for monitoring, operation, maintenance, tank pumping, system inspection, and electrical cost.

- Installation description

  Additional aerobic treatment systems will be constructed next to the existing aerobic treatment system. Each system contributed will utilize its own tanks, plumbing, and electrical systems. Visitors to the site will be able to view available products on the market by a variety of manufacturers.

- Pollution Control Relative Efficiency

  The efficiencies listed below were compiled from the following sources:

  1. Onsite Wastewater Treatment Systems Fact Sheet 1 Continuous-Flow, Suspended-Growth Aerobic System (CFSGAS), U.S. E.P.A.

  2. Crites and Tchobanoglous Small and Decentralized Wastewater Management Systems, McGraw-Hill 1998.

  3. Decentralized Systems Technology Fact Sheet Aerobic Treatment, EPA 832-F-00-031.

  - Ammonia Removal: 20-80%
  - Biochemical Oxygen Demand Removal: 60-90%
  - Fecal Coliform Removal: 60-99%
  - Total Nitrogen Removal: 40-90%
  - Total Suspended Solids Removal: 60-90%
  - Phosphorus Removal: 0-25%

The above range of efficiencies can be expected due to variations at the individual installation based on: waste strength, cell design, media type and size, hydraulic loading (detention time), operations and maintenance, and ambient weather conditions at the location of installation.

- Inspection, Operation and Maintenance Requirements
    - Pumps and floats must be checked at least once a month.
    - Pump and/or septic tank filters must be inspected and cleaned each month.
    - Pump and/or septic tanks must be inspected each month and pumped as needed
    - For stream discharge systems, the Kentucky Division of Water requires effluent sampling and analysis.

- BMP Target:
    - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END AEROBIC UNIT

WATERLOO BIOFILTER SYSTEM

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Treatment Unit
    - Hardware (screws, nails, fasteners)
    - Gravel
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass seed/Straw
    - Pump
    - Pump Controls
    - Electrical components
    - Septic/Pump Tank
- Estimated Cost of Training Center Installation:
  - Treatment Unit $12,000.00
  - Hardware $ 25.00
  - Gravel $ 250.00
  - Sand $ 250.00
  - Piping $ 150.00
  - Grass seed/Straw $ 30.00
  - Pump $ 500.00
  - Pump Controls $ 350.00
  - Electrical components $ 350.00

- Installation $ 1500.00

TOTAL: $15405.00

- Estimated Cost of Installation for Homeowner

  The cost of a Waterloo Biofilter System to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $10,000 - $20,000, which would include installation, treatment unit, pump tank, pumps and controls, electrical installation, and soil absorption field.

- Typical Operation and Maintenance Annual Cost: $50-$150/Year for operation, maintenance, tank pumping, system inspection, and electrical cost.

- Installation description

  The Waterloo system will be constructed next to the existing Zabel Aerocell and utilize the existing septic tank and pump. Additional piping will be needed for connection to the water source.

- Pollution Control Relative Efficiency

  The efficiencies listed below were compiled from the following sources:

  1. Waterloo Biofilter Systems Inc. pamphlet.
  2. Field Performance of the Waterloo Biofilter with Different Wastewater, WWBLRE20, National Small Flows Clearing House.

  - Biochemical Oxygen Demand Removal: 80-95%
  - Fecal Coliform Removal: 95-99%
  - Total Nitrogen Removal: 20-60%
  - Total Suspended Solids Removal: 90-97%
  - Phosphorus Removal: 30-90%

The above range of efficiencies can be expected due to variations at the individual installation based on: waste strength, cell design, media type and size, hydraulic loading (detention time), operations and maintenance, and ambient weather conditions at the location of installation.

- Inspection, Operation and Maintenance Requirements

  - Pumps and floats must be checked at least once a year.
  - Media cell must be inspected for buildup of organic material and cleaned as necessary.
  - Pump and/or septic tank filters must be inspected and cleaned each year.
  - Pump and/or septic tanks must be inspected each year and pumped every 3 to 5 years.

- BMP Target:
    - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END WATERLOO BIOFILTER SYSTEM

LOW-PRESSURE DISTRIBUTION SYSTEM

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Bracing Materials
    - Hardware (screws, nails, fasteners)
    - Gravel
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass seed/Straw
    - Pump
    - Pump Controls
    - Electrical components
    - Septic/Pump Tank
- Estimated Cost of Training Center Installation:
  - Bracing Materials $ 300.00
  - Hardware $ 25.00
  - Gravel $ 500.00
  - Framing Materials $ 300.00
  - Piping $ 25.00
  - Grass seed/Straw $ 30.00
  - Pump $ 500.00
  - Pump Controls $ 350.00
  - Electrical components $ 500.00

- Septic/Pump Tank $ 750.00
- Installation $1500.00

TOTAL: $4780.00

- Estimated Cost of Installation for Homeowner

  The cost of a low-pressure distribution system to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $6,000 - $15,000, which would include installation, treatment unit, pump tank, pumps and controls, electrical installation, and soil absorption field.

- Typical Operation and Maintenance Annual Cost: $50-150/ Year for monitoring, operation, maintenance, tank pumping, system inspection, and electrical cost.
- Installation description

  The low-pressure distribution system will be included as part of the soil absorption demonstration, which will include traditional gravel trenches, gravel beds, gravelless pipe, and chambers.

- Pollution Control Relative Efficiency

  The information contained below was compiled from the following sources:

  1. Low-Pressure Pipe Systems, Environmental Technology Institute, National Small Flows Clearinghouse.

  2. Maintenance of Low Pressure Distribution Septic Systems The Water Quality Program Committee, Virginia Tech Publication Number 448-402, October 1996.

  3. Lesikar, Bruce J On-Site Wastewater Treatment Systems: Low-Pressure Dosing System L-5235 .

The Low-Pressure Pipe System (LPP) was chosen as a demonstration because less than two-thirds of the soil in Kentucky is suitable for the use of conventional soil absorption systems, as reported by the Kentucky Division of Water and the Kentucky Environmental Quality Commission. The LPP combined with proper (uniform) pressure dosing, addresses both the aerobic and anaerobic conditions that exist in poor or shallow soils, allowing more efficient treatment of domestic wastewater.

- Inspection, Operation and Maintenance Requirements

  - Pumps and floats must be checked at least once a year.
  - Pump and/or septic tank filters must be inspected and cleaned each year.
  - Pump and/or septic tanks must be inspected each year and pumped as needed. Typically, tanks will need pumping every 3 to 5 years.

- Pipes and orifices must be checked at least once a year for plugging and clogging and cleaned as necessary

- BMP Target:
  - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END LOW-PRESSURE DISTRIBUTION SYSTEM

CHAMBER DISTRIBUTION SYSTEM

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Chambers
    - Hardware (screws, nails, fasteners)
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass seed/Straw
    - Pump
    - Pump Controls
    - Electrical components
    - Septic/Pump Tank
- Estimated Cost of Training Center Installation:
  - Chambers $ 400.00
  - Hardware $ 25.00
  - Piping $ 50.00
  - Grass seed/Straw $ 30.00
  - Installation $1500.00

TOTAL: $2005.00

- Estimated Cost of Installation for Homeowner

  The cost of a chamber system to distribute domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $4,000 - $10,000, which

would include installation, chambers, septic tank/pump tank, pumps and controls, electrical installation, and soil absorption field.

- Typical Operation and Maintenance Annual Cost: $25-100/Year for operation, maintenance, tank pumping, system inspection, and electrical cost.

- Installation description

  The chamber distribution system will be included in the soil absorption demonstration.

- Pollution Control Relative Efficiency

  The information contained below was compiled from the following sources:

  1. Low-Pressure Pipe Systems, Environmental Technology Institute, National Small Flows Clearinghouse.

  2. Chamber Overview Infiltrator Systems Inc.

  3. EnviroChamber™ system is ideal for remote New Hampshire town, Hancor Industries.

The chamber system was chosen as a demonstration because less than two-thirds of the soil in Kentucky is suitable for the use of conventional soil absorption systems as reported by the Kentucky Division of Water and the Kentucky Environmental Quality Commission. The chamber system addresses both the aerobic and anaerobic conditions of poor or shallow soils, thus providing more efficient wastewater treatment.

- Inspection, Operation and Maintenance Requirements

  - Pumps and floats must be checked at least once a year.
  - Pump and/or septic tank filters must be inspected and cleaned each year.
  - Pump and/or septic tanks must be inspected each year and pumped as needed. Typically, tanks will need pumping every 3 to 5 years.
  - Pipes and orifices must be checked at least once a year for plugging and clogging and cleaned as necessary

- BMP Target:

- This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END CHAMBER DISTRIBUTION SYSTEM

GRAVELLESS PIPE DISTRIBUTION SYSTEM

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Gravelless Pipe
    - Hardware (screws, nails, fasteners)
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass seed/Straw
- Estimated Cost of Installation:
  - Gravelless Pipe $ 320.00
  - Hardware $ 25.00
  - Piping $ 50.00
  - Grass seed/Straw $ 30.00
  - Installation $1500.00

TOTAL: $1925.00

- Estimated Cost of Installation for Homeowner

  The cost of a gravelless pipe system to distribute domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $4,000 - $10,000, which would include installation, gravelless pipe, septic tank/pump tank, pumps and controls, electrical installation, and soil absorption field.

- Typical Operation and Maintenance Annual Cost: $25-100/Year for operation, maintenance, tank pumping, system inspection, and electrical cost.

- Pollution Control Relative Efficiency

  The efficiencies listed below were compiled from data contained in:

  1. Gravelless Drainfields Technology Package, WWBKGN74, National Small Flows Clearinghouse.

The 254 mm (10 in.) diameter tubing is designed to be equivalent to a 3-foot wide gravel trench

The 203 mm (8 in) diameter tubing is designed to be equivalent to a 2-foot wide gravel trench

- Installation description

  The gravelless pipe will be included in the soil absorption demonstration.

- BMP Target:

  - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END GRAVELLESS PIPE DISTRIBUTION SYSTEM

LAGOON SYSTEM

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Hardware (screws, nails, fasteners)
    - Grass seed/Straw
    - Pump
    - Pump Controls
    - Electrical components
    - Fence
    - Septic/Pump Tank
- Estimated Cost of Training Center Installation:
  - Piping $ 50.00
  - Grass seed/Straw $ 30.00
  - Hardware $ 25.00
  - Pump $ 500.00
  - Pump Controls $ 350.00
  - Electrical components $ 350.00
  - Fence $1500.00
  - Installation $2000.00

TOTAL: $4805.00

- Estimated Cost of Installation for Homeowner

  The cost of a lagoon system to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $4,000 - $10,000, which would include installation, septic tank/pump tank, pumps and controls, electrical installation, and soil absorption field.

- Typical Operation and Maintenance Annual Cost: $25-100/Year for operation, maintenance, tank pumping, system inspection, vegetation control, and electrical cost.

- Installation description

  The lagoon will be included as part of the wetland demonstration and will provide storage of rainwater for use in other demonstrations.

- Pollution Control Relative Efficiency

  The efficiencies listed below were compiled from data contained in:

  1. Onsite Wastewater Treatment Systems Technology Fact Sheet7, Stabilization Ponds, FWS, Constructed Wetlands, and Other Aquatic Systems, U.S. E.P.A.

     - Ammonia Removal: 0-80%
     - Biochemical Oxygen Demand Removal: 75-95%
     - Fecal Coliform Removal: 2 - 3 log
     - Total Nitrogen Removal: 0-60%
     - Total Suspended Solids Removal: 0-90%
     - Phosphorus Removal: 0-50%

The above range of efficiencies can be expected due to variations at the individual installation based on: waste strength, lagoon design, hydraulic loading (detention time), operations and maintenance, and ambient weather conditions at the location of installation.

- Inspection, Operation and Maintenance Requirements

  - Pumps and floats must be checked at least once a year.
  - Pump and/or septic tank filters must be inspected and cleaned each year.
  - Pump and/or septic tanks must be inspected each year and pumped as needed. Typically, tanks will need pumping every 3 to 5 years.
  - Vegetation control must be maintained around lagoon on a regular basis.

- BMP Target:

  - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END LAGOON SYSTEM

CONVENTIONAL SYSTEM TROUBLESHOOTING DEMONSTRATION

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Hardware (screws, nails, fasteners)
    - Gravel
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass seed/Straw
    - Septic/Pump Tank
- Estimated Cost of Installation:
  - Hardware (screws, nails, fasteners) $ 25.00
  - Gravel $1000.00
  - Piping (cleaner, glue, elbows, couplers, etc.) $ 300.00
  - Grass seed/Straw $ 60.00
  - Septic/Pump Tank $ 750.00
  - Installation $2000.00

TOTAL: $4135.00

- Estimated Cost of Installation for Homeowner

  The cost of a conventional septic tank system to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $4,000 -

$8,000, which would include installation, septic tank/pump tank, pumps and controls, electrical installation, and soil absorption field.

- Typical Operation and Maintenance Annual Cost: $50-100/ Year for operation, maintenance, tank pumping, system inspection, and electrical cost.

- Installation description

  The trouble shooting demonstration will be included in the soil absorption demonstration.

- Pollution Control Relative Efficiency

  This demonstration will be used as a trouble shooting exercise for installers and inspectors to evaluate and make corrections as needed. The following are a few examples of typical problems that can be included in a troubleshooting scenario:

  Improperly leveled tank
  Improperly connected pipe
  Improperly installed tank
  Improperly installed soil absorption system
  Damaged soil absorption system
  Improperly installed distribution boxes
  Improperly connected distribution boxes
  Improperly leveled soil absorption system

- Inspection, Operation and Maintenance Requirements

  - Pumps and floats must be checked at least once a year.
  - Pump and/or septic tank filters must be inspected and cleaned each year.
  - Pump and/or septic tanks must be inspected each year and pumped as needed. Typically, tanks will need pumping every 3 to 5 years.

- BMP Target:

  - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END CONVENTIONAL SYSTEM TROUBLESHOOTING DEMONSTRATION

LOW-PRESSURE DISTRIBUTION SYSTEM TROUBLESHOOTING DEMONSTRATION

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Framing Materials
    - Hardware (screws, nails, fasteners)
    - Gravel and Sand
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass seed/Straw
    - Pump
    - Pump Controls
    - Electrical components
    - Septic/Pump Tank
- Estimated Cost of Training Center Installation:
  - Framing Materials $ 500.00
  - Hardware (screws, nails, fasteners) $ 50.00
  - Gravel $1000.00
  - Piping (cleaner, glue, elbows, couplers, etc.) $1000.00
  - Grass seed/Straw $ 30.00
  - Pump $ 500.00
  - Pump Controls $ 350.00
  - Electrical components $ 350.00

- Septic/Pump Tank $ 750.00
- Installation $2500.00

TOTAL: $7030.00

- Estimated Cost of Installation for Homeowner

  The cost of a low-pressure distribution system to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $6,000 - $15,000, which would include installation, treatment unit, septic/pump tank, pumps and controls, electrical installation, and soil absorption field.

- Typical Operation and Maintenance Annual Cost: $50-150/ Year for monitoring, operation, maintenance, tank pumping, system inspection, and electrical cost.
- Installation description

  The trouble shooting demonstration will be included in the soil absorption demonstration.

- Pollution Control Relative Efficiency

  This demonstration will be used as a trouble shooting exercise for installers and inspectors to evaluate and make corrections as need. Examples of typical problems to be include:

  Improperly sized pumps
  Improperly connected pipe
  Improperly orifice placement
  Improperly orifice size
  Plugged orifices
  Damaged piping
  Improperly installed piping
  Improperly leveled soil absorption system

- BMP Target:
  - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END LOW-PRESSURE DISTRIBUTION SYSTEM TROUBLESHOOTING DEMONSTRATION

WATER CONSERVATION DEMONSTRATION

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Framing Materials
    - Hardware (screws, nails, fasteners)
    - Gravel Liner
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass seed/Straw
    - High and low flush toilets
    - High and low flow shower heads
    - High and low flow faucets
- Estimated Cost of Training Center Installation:
  - Framing Materials $ 300.00
  - Hardware (screws, nails, fasteners) $ 50.00
  - Gravel $ 150.00
  - Piping (cleaner, glue, elbows, couplers, etc.) $ 150.00
  - Grass seed/Straw $ 30.00
  - High and low flush toilets $ 350.00
  - High and low flow shower heads $ 100.00
  - High and low flow faucets $ 100.00
  - Miscellaneous devices $1000.00

- Installation
  $1000.00

TOTAL:
$3230.00

- Estimated Cost of Installation for Homeowner

  The cost of water saving devices for a 3-4 Bedroom Home in Kentucky will range in price from $500 - $3,000, which would include installation and the various devices

- Typical Operation and Maintenance Annual Cost: The use of water saving devices in the home will typically save the homeowner 10-40% of annual utility costs.

- Pollution Control Relative Efficiency

  This demonstration will provide students with training on the various types of household water-saving devices and their effectiveness in reducing the total amount of water used by domestic households.

- BMP Target:
  - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END WATER CONSERVATION DEMONSTRATION

PUMP AND CONTROL SYSTEM AND TROUBLESHOOTING DEMONSTRATION

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw etc.)
  - Materials
    - Framing Materials
    - Hardware (screws, nails, fasteners)
    - Wiring
    - Piping (cleaner, glue, elbows, couplers, etc.)
    - Grass seed/Straw
    - Pumps
    - Pump Controls
    - Electrical components
    - Septic/Pump Tank

- Estimated Cost of Training Center Installation:
  - Framing Materials $ 300.00
  - Hardware (screws, nails, fasteners) $ 50.00
  - Wiring $ 150.00
  - Piping (cleaner, glue, elbows, couplers, etc.) $ 150.00
  - Pumps $1500.00
  - Pump Controls $1000.00
  - Electrical components $ 350.00
  - Installation $1500.00

TOTAL: $5000.00

- Estimated Cost of Installation for Homeowner

  The cost of pump and pump control systems used in treatment systems for a 3-4 Bedroom Home in Kentucky will range in price from $2,000 - $5,000, which would include installation, pumps and controls, and electrical installation.

- Typical Operation and Maintenance Annual Cost: $50-150/Year for operation, maintenance, tank pumping, system inspection, and electrical cost.

- Installation description

  The trouble shooting demonstration will be included in the soil absorption demonstration. Separate traveling displays will be prepared for off-site training.

- Pollution Control Relative Efficiency

  This demonstration will be used to provide students with training in the various types and sizes of pumps and control system and the selection of the proper system for treatment of wastewater generated by domestic households.

  Additionally, this demonstration will be used as a troubleshooting exercise for installers and inspectors to evaluate and make corrections as need. Examples of typical problems that can be incorporated in the troubleshooting segment of the demonstration include:

  Improper timer settings
  Improper float settings
  Wiring problems
  Voltage checks
  Amperage checks
  Power demand

- Pollution Control Relative Efficiency

- BMP Target:

  - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END PUMP AND CONTROL SYSTEM DEMONSTRATION AND TROUBLESHOOTING

SEPTIC AND PUMP TANK DISPLAY

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Total System Installation Requirements
  - Equipment
    - Backhoe
    - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
  - Materials
    - Septic and Pump Tanks of various configurations
    - Hardware (screws, nails, fasteners)
    - Gravel and Sand
    - Grass seed/Straw
- Estimated Cost of Training Center Installation:
  - Septic and Pump Tanks of various configurations $5000.00
  - Hardware (screws, nails, fasteners) $ 50.00
  - Gravel and Sand $1000.00
  - Grass seed/Straw $ 30.00
  - Installation $1500.00

  TOTAL: $7580.00
- Estimated Cost of Installation for Homeowner

  The cost of a septic tank to treat domestic wastewater from a 3-4 Bedroom Home in Kentucky will range in price from $800 - $1,500, which would include installation, and the septic tank/pump tank.
- Typical Operation and Maintenance Annual Cost: $50-150/Year for operation, maintenance, tank pumping, system inspection, and electrical cost.
- Pollution Control Relative Efficiency

This demonstration will be used to provide students with training in the various types and sizes of septic and pump tanks and the selection of the proper tank for treatment of wastewater generated by domestic households.

- Inspection, Operation and Maintenance Requirements

  Regular mowing and upkeep of demonstration will be required.

- BMP Target:
  - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

SEPTIC AND PUMP TANK DISPLAY

BACKHOE PIT AND SOIL DEMONSTRATION

Financial Plan of Action

Cash or in-kind match contributed by the Association's non-federal and non-501(c)(4) project partners. KCTCS equipment used in the installation of systems or site maintenance will be contributed by KCTCS as part of the in-kind match.

Technical Aspects

- Equipment
  - Backhoe
  - Hand tools (hammer, wrenches, screwdrivers, shovels, saw, laser level or transit etc.)
- Materials
  - Gravel
  - Hardware (screws, nails, fasteners)
  - Lumber
  - Roofing Materials
  - Shoring/Timbers
  - Grass seed/Straw

- Estimated Cost of Training Center Installation:
  - Gravel $ 500.00
  - Hardware (screws, nails, fasteners) $ 75.00
  - Lumber/ Roofing Materials/ Shoring/Timbers $1200.00
  - Grass seed/Straw $ 30.00
  - Installation $2000.00

TOTAL: $3805.00

- Estimated Cost of Installation for Homeowner

  The cost of soil evaluation for a 3-4 Bedroom Home in Kentucky will range in price from $50-150, which would include sampling and evaluation fees.

- Typical Operation and Maintenance Annual Cost: None.

- Pollution Control Relative Efficiency

This demonstration will be used to provide students with training in the various aspects of soil identification and classifications for determining the suitability of different soil types and their effectiveness in treating wastewater generated by domestic households.

- Inspection, Operation and Maintenance Requirements

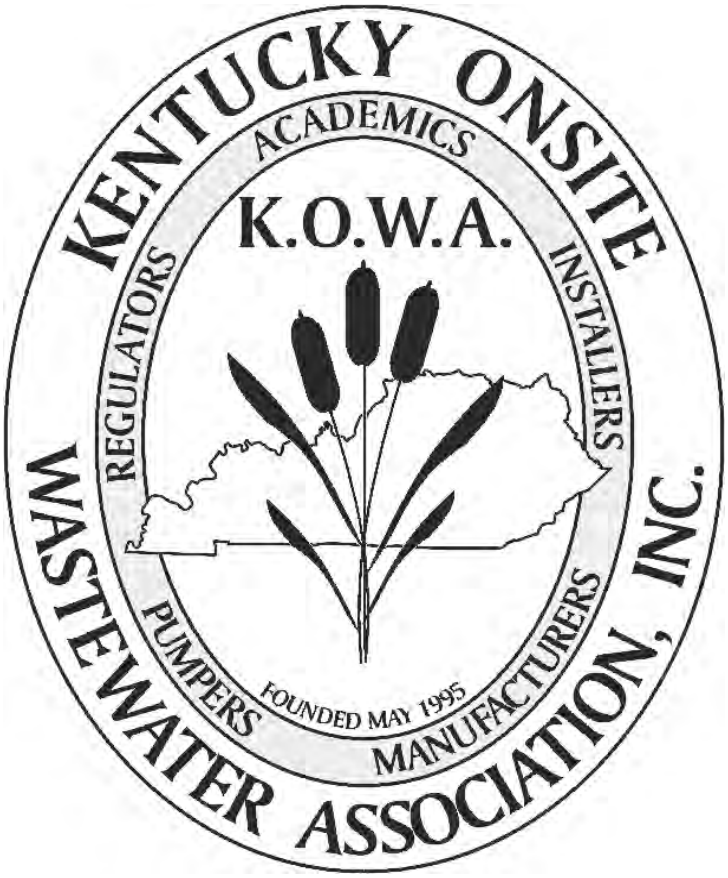
  Regular mowing and upkeep of demonstration will be required.

- BMP Target:
  - This demonstration will be for training purposes and will not contain any wastewater. The target for this demonstration will be installers, state regulators, homeowners, and public officials.

END BACKHOE PIT AND SOIL DEMONSTRATION

KENTUCKY WASTEWATER EDUCATION PROGRAM MANUAL

A PROPOSED MODEL FOR ONSITE WASTEWATER EDUCATION IN KENTUCKY



WORKING DRAFT

Updated September 2007

Kentucky Wastewater Education Program Manual

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Introduction

Septic wastewater of human origin entering surface and subsurface waters is a major concern in Kentucky. Septic waste, or perhaps more correctly stated, "improper treatment or lack of treatment of septic wastewater," is recognized as a leading cause of nonpoint source (NPS) pollution. The Kentucky Division of Water estimates that nearly 532 miles of Kentucky rivers and streams are impaired through residential related sources, the most significant of these being onsite treatment systems including straight pipe discharges.[1] Pollutants associated with human waste include bacteria and other pathogens, nutrients and organic matter.

Onsite wastewater systems continue to be the most affordable source of wastewater treatment for rural and semi-rural Kentucky citizens. Approximately 45.9% of existing households (615,360) in Kentucky are not connected to centralized or municipal wastewater treatment systems.[2] Inadequate design, improper siting and installation, and lack of an operation and maintenance program account for most of the system failures that occur, thereby exposing citizens to unacceptable health hazards.

Current technologies exist, and new technologies are continually being developed, which can effectively address these NPS pollution issues. This is true when the onsite technology is properly selected, installed, and maintained. Onsite technologies can efficiently treat waste at their origin, can recycle water at that same site, require few chemicals or power inputs, and therefore fit into the framework of sustainable community development. During a study conducted by The Kentucky Environmental Quality Commission (EQC), concerns were expressed about the inconsistent and/or poor design of onsite sewage systems, and a lack of expertise and knowledge of alternative, low-cost systems. [3] The study also revealed that poor operation and maintenance by system owners contribute to system failures. Many of those in the onsite industry agree that promotion of adequate operation and maintenance is needed to prevent pollution and protect public health.[4]

As recognized by the EQC, education must play a key role in dealing with the onsite wastewater problems. The EQC developed seven (7) key recommendations for Kentucky. Recognizing the limited funding and staff within lead state agencies, the EQC supports partnerships that promote collaborative and innovative solutions to address

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[1] Kentucky Environmental and Public Protection Cabinet, 2006 Integrated Report to Congress on Water Quality in Kentucky, June 2006, p. 75.

[2] Personal communication with Julie Smoak, Kentucky Division of Water, Nov. 2007.

[3] Kentucky Environmental Quality Commission, Onsite Sewage in Kentucky, November 15, 1999, p. 10.

[4] Ibid., p. 11.

onsite sewage problems.[5] The EQC called upon state agencies to prepare an Action Plan to improve onsite sewage programs in Kentucky. Specifically, the action plan must address development of state/community partnerships to implement innovative onsite technology and demonstration projects, promotion of consistent design criteria for onsite sewage systems, development of measures to promote proper operation and maintenance of onsite systems, development of a statewide education/outreach initiative, and training for onsite professionals.[6] Recommendation #6 called for a public education program to reach homeowners, lenders, realtors, homebuilders, etc., building awareness of proper onsite sewage treatment and disposal.[7]

The Kentucky Onsite Wastewater Association, Inc. (KOWA) is a non-profit organization dedicated to raising the professionalism of the onsite industry, thereby positively affecting public perception of onsite issues. Its governing board includes representatives from all areas of the onsite industry. KOWA has taken a lead role in protecting the quality of our ground water by building a foundation for such an educational system as recommended by the EQC. The organization has trained installers, pumpers, and regulators during its annual conference and individual training sessions around the state since 1995. In 1999, the U.S. EPA awarded KOWA a seed grant to begin development of a center for onsite technology demonstrations. From 2002 through 2007, KOWA utilized 319(h) funds provided through the Kentucky Division of Water to initiate the Kentucky Wastewater Education Program on which this manual is based.

The Kentucky Wastewater Education Program has as its primary goal the establishment of an effective system of education that will provide needed training and outreach to all parties essential to solving onsite wastewater problems. KOWA believes that a true statewide system of education involves reaching installers, pumpers, regulators, and the public and private sectors. An educational program directly targeting onsite wastewater issues will assist in improving degraded water quality resulting from non-existent, inadequate, and failing onsite systems, as well as the future protection of limited surface and groundwater resources from this form of NPS pollution.

This draft manual is intended for use as an internal guidance document to assist KOWA, state regulatory leadership, and other onsite education partners in visualizing, shaping, and implementing education and outreach efforts of the Kentucky Wastewater Education Program. The manual is a result of work begun under the 319(h) Grant Agreement, but it encompasses a long-range vision for onsite wastewater education in Kentucky. This manual should not be viewed as a completed document, and there are no plans for publication at this time. Rather, this document should be considered a "work in progress," subject to inclusion of new information and data as it becomes available or as goals and directions grow and change.

Acknowledgements

[5] Ibid., p. 14.

[6] Ibid., p. 15.

[7] Ibid., p. 17.

Portions of the proposed model program for Kentucky are based on national model curriculums developed by the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT) from work supported by the National Decentralized Water Resources Capacity Development Project (NDWRCDP) with funding provided by the U.S. Environmental Protection Agency through a Cooperative Agreement (EPA No. CR827881-01-0) with Washington University in St. Louis.

Specific adaptations from the CIDWT model include the Programs of Study and Course Descriptions. Individual courses adapted from CIDWT materials and tailored to Kentucky are specifically cited as to origination.

The Kentucky Onsite Wastewater Association, Inc. developed this document as a model to aid in facilitating discussion among onsite wastewater leadership in Kentucky. This work was funded in part by a grant from the U.S. Environmental Protection Agency under §319(h) of the Clean Water Act through the Kentucky Division of Water to Kentucky Onsite Wastewater Association (Grant # C9994861-01). This manual has not been reviewed by, nor does it necessarily reflect, the views and policies of the CIDWT, NDWRCDP, Washington University, the U.S. Environmental Protection Agency, Kentucky Division of Water, or Kentucky Department of Public Health, nor does the mention of trade names or commercial products constitute their endorsement or recommendation for use.

PRACTITIONER EDUCATION

PRACTITIONER EDUCATION

OVERVIEW

For purposes of the Kentucky Wastewater Education Program, the term "practitioner" can be defined as "onsite or decentralized wastewater industry professionals." In Kentucky, these professionals primarily include installers, service professionals, and system inspectors.

System installers are currently the largest sub-group of practitioners, with an estimated 3,000 certified statewide by the Kentucky Department for Public Health (DPH). State certification involves an initial exam, installation of a required minimum number of systems, and six (6) contact hours of continuing education annually approved by the DPH. Education levels of these individuals range from very limited to college educations. Business ownership and size range from sole proprietorships to companies with multiple employees. Industry experience ranges from those who are newly certified to those with many years of experience.

Service professionals (operation and maintenance providers) are perhaps more difficult to define as there is currently no clear-cut regulation or certification of these individuals in Kentucky. The primary group of service professionals is septic tank "pumpers." Pumpers are licensed by the DPH, but there is currently no continuing education requirement. There are approximately 300 licensed pumpers statewide. In some cases, certified installers are also pumpers. Education levels, business size and industry experience parallels that of certified installers. Other service professionals may include those who have been trained, certified, or otherwise approved by manufacturers to service or monitor specific onsite wastewater treatment systems or components. The majority of this service work occurs in counties or districts that have adopted an operation and maintenance ordinance for alternative or experimental systems.

In Kentucky, system "inspectors" commonly refers to those individuals employed by the Department for Public Health. Other titles include environmentalist, regulator, or registered sanitarian. These individuals may work at the local (county), district, or state level. A college education is required for employment. Most local or county regulators (inspectors) handle multiple environmental functions, one of which is onsite wastewater. Inspectors may be employed as the sole environmentalist in small, rural counties, or may be more specialized if working in a larger county where two or more environmentalists are employed. Industry experience ranges from those newly employed to those with many years of experience. Onsite knowledge of the newly employed inspector is usually limited as college degrees required for job entry are varied and do not often include onsite wastewater education. Those with a soils or engineering background may be slightly better prepared than those with other degrees. Newly employed inspectors must complete preliminary training to become certified to regulate the onsite program in their respective counties. This certification currently includes a 4-day Soils I training at the University of Kentucky, Phase I training (three days of classroom training with the state's onsite staff), five individual training visits within the county, and Phase II training (five

days of classroom and field training). Testing is a part of both Soils I and Phase II training. After passing Phase II training, inspectors are provisionally certified to regulate onsite in their counties. The state office then conducts quarterly training visits and after at least three quarterly visits, inspectors must pass a full certification field test. Thereafter, inspectors are required to obtain ten (10) contact hours of continuing education annually in the environmental field. Although individual inspectors may choose to obtain all or a portion of their annual contact hours in onsite wastewater education, there is no state requirement that they do so. Local health department inspections of onsite systems include new system installations, those installed under local operation and maintenance ordinances, or existing systems based on registered complaints.

The number of private sector inspectors, such as those hired by realtors, bankers, or homeowners, to perform septic system inspections as part of the home inspection for property transfer, is considered limited in Kentucky at this time. Septic tank or wastewater disposal inspections do not appear to be a specific task of a licensed home inspector, and there is no state regulation of onsite or septic inspections by private inspectors at this time. In some counties, this inspection service is provided by the local health department. A few certified installers and pumpers are also beginning to integrate this service into their businesses.

Beyond the three practitioner sub-groups described above, a small number of designers and engineers are involved in wastewater disposal in Kentucky at this time. Currently, most college or engineering schools do not incorporate onsite wastewater disposal into their curriculum, therefore, onsite knowledge and experience of new graduates is likely very limited. Designers and engineers may receive “on-the-job” training through employment with other practitioners or manufacturers. Designers and engineers entering the onsite industry independently will likely lack much of the needed knowledge.

As described, the knowledge, skills and abilities of the practitioner sector varies widely statewide, as does the regulatory or licensing requirements of those practitioners. The onsite industry in Kentucky can benefit greatly from a standard knowledge and skill set applied statewide. The message objective of a practitioner education program must be to improve the knowledge, skills, and abilities needed by practitioners to effectively determine, utilize, and maintain appropriate technologies for wastewater disposal. The utilization and maintenance of appropriate technology is vital to addressing onsite wastewater disposal issues in terms of reducing NPS pollution in Kentucky.

As acknowledged previously, the Practitioner Education component of the Kentucky Wastewater Education Program, as it is currently envisioned, reflects a curriculum model based on that of the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT). The Kentucky model is similar to the CIDWT national model in that it features training courses for practitioners ranging from the beginner to the experienced professional. Courses are organized by subject, with a numbering system indicating course difficulty. Under the CIDWT model, completion of the recommended number of courses for a specific target audience culminates in a single level program completion or

competency. The Kentucky model differs from the CIDWT model in that it provides opportunity for practitioners to achieve various levels of certification within the full range of curriculum, progressing from beginner to more advanced levels.

It is important to note that a practitioner education program for the mere sake of offering education alone will not appeal to the majority of Kentucky practitioners at this time. The onsite industry in Kentucky relies heavily on traditional installation methods, informal business practices, and local policy. For an education program to appeal to Kentucky practitioners, it must have value and meaning, both to individuals and to the state's onsite arena. Two things must take place for such a program to succeed, and the two are closely linked. On one hand, individuals must view education as vital to them personally, to their business, and therefore, ultimately to their net profit and long-term sustainability in the industry. The program must provide them the means to improve their local business, increase their qualifications and reputations as high-quality practitioners in their communities, enable them to provide quality skills for maximum returns from clients, and gain an advantage over competitors. For this to occur, individual practitioners must realize that the onsite climate in Kentucky is beginning to change and will change in coming years in response to pollution and water quality issues, both on the state and national levels. To remain responsive to those changes, practitioners must desire and seek the knowledge and skills they currently lack but will need in future years. Program outreach and marketing will be vital to conveying this message to the state's practitioners, but will be insufficient without a dynamic and coordinated onsite wastewater industry involving all stakeholders. Thus, the second thing that must take place in Kentucky is an integrated onsite wastewater program with a long-range view of treatment and disposal issues. Leadership of all involved parties must work together to determine the needs, constraints, and solutions for moving Kentucky forward in terms of wastewater disposal. Practitioner certification and education are foundational to these efforts, particularly in view of long-term changes. Such certification and education must be proactive. That is, it must be addressed immediately in order to prepare practitioners for changes to come and allow them time to attain the necessary skills and knowledge. Education must be forward thinking in that it provides practitioners a base set of knowledge that can easily be built upon in future to accommodate specific needs and interests, as well as changing industry conditions and technologies. Finally, education must be high quality and appropriate for varied educational levels of practitioners. Obviously, practitioner education is a highly complicated issue. The goal of this proposed model program is to partner with state government, building on earlier discussions, to develop a certification and education process for the onsite wastewater industry in Kentucky that meets current and future needs.

PRACTITIONER PROGRAMS OF STUDY
(System Installers and Service Professionals)

COURSE NUMBER	COURSE TITLE	PRACTITIONER MODULES				
Septic System Basics:		**Installer I**	**Installer II**	**Installer III**	**Service Pro I**	**Service Pro II**
Septic 1	Your Onsite Wastewater Treatment System- A Homeowners Manual			X		X
Septic 2	Community Choices			X		X
Septic 3	Drinking Water Well & Septic Systems for Real Estate			X		X
Septic 100	Planning Development Using the Decentralized Technology Approach			X		X
Septic 101	Community Wastewater Needs Assessment			X		X
Septic 201	Wastewater & the Environment			X		X
	A Kentucky Homeowner's Guide to Septic Systems (handout)	X	X	X	X	X
	Ky. Onsite Sewage Disposal Systems Regulation (handout)	X	X	X	X	X
	Guide to Onsite Wastewater & New Construction (handout)					
	So, You Want to Build A House (handout)					
Onsite Wastewater Overview:						
Onsite 100	Basics of Onsite Sewage	X				
Onsite 101	Introduction to Soils & Site Evaluation	X				
Onsite 102	Onsite System Technologies	X				
Onsite 103	Kentucky Onsite Regulations	X				
Onsite 104	Onsite System Components	X				
Onsite 105	Mathematics for Subsurface System Operators		X			
Onsite 110	Septic Tanks & Effluent Filters	X				
Onsite 111	Gravity Distribution Systems	X				
Onsite 112	Pump Systems		X			
Onsite 120	Pretreatment Overview		X		X	
Onsite 130	Introduction to Drip Irrigation			X		
Onsite 140/141	Introduction to Wastewater Microbiology & Chemistry	X				
Onsite 150	Introduction to Disinfection Systems			X		
Onsite 200	Septic System Options for Difficult Sites		X			
Onsite 202	High Strength & Commercial Wastewater			X		
Onsite 280	Advanced Wastewater Biology & Chemistry			X		
Onsite 290	Advanced Wastewater Disinfection			X		
Site and Soil Evaluation:						
Soils 100	Getting the Dirt on Soils	X				
Soils 101	Field Description of Soil Morphology		X		X	
Soils 102	Soil Wetness & Water Table Relationships		X		X	
Soils 103	Soil Structure		X			
Soils 104	Soil Texture		X			
Soils 105	Site Conditions & Landscape Assessment			X		

Soils 110	Water Movement & Treatment in Soils			X		
Soils 200	Matching the System to the Soil: Integrating Soil Morphology w/ Land Needs		X		X	
Soils 201	Soil Consistence, Mineralogy and Expansive Characteristics			X		
Soils 202	Saturated Hydraulic Conductivity as a Site Evaluation Tool					
Soils 203	Assessment of Water Flow at Sites Proposed for Large Capability of Soils				X	
Soils 204	Use of Computer Models to Predict Drainage Capability of Soils					
Soils 205	Site Evaluation of Saprolite			X		
Soils 210	Site Evaluation of Restrictive Horizons		X		X	
Soils 220	Lab Analysis of Soils Properties					
Soils 300	Soils of the Southeastern U.S. Region			X		
Soils 310	Soil Site Evaluation for Septic Systems			X		
System Design & Engineering:						
Design 099	Basic Conventional OWTS Design	X				
Design 100	Principles of Design		X		X	
Design 101	Best Management Practices for Design		X		X	
Design 200	Pump and System Design			X		X
Design 201	Control Systems			X		X
Design 202	Low-Pressure Piping Systems			X		
Design 203	Drip Irrigation System Design			X		
Design 204	Spray Irrigation System Design			X		
Design 240	Mound and At-Grade System Design			X		
Design 260	Advanced Pretreatment System Design			X		
Design 270	Design & Use of Disinfection Systems			X		
Design 280	Water Re-use Systems					
Design 300	Large System Design					
Design 301	Design Collaborative Workshop					
Design 310	Applied Hydraulics					
Alternative Treatment Systems:						
ATS 100/101	Onsite WastewaterTechnology Overview	X				
ATS 200	Wetland Treatment Systems		X			
ATS 201	Sandfilter Treatment Systems					
ATS 202	Recirculating Gravel Treatment Systems					
ATS 203	Fixed Media Treatment Systems					
ATS 204	Suspended Growth Treatment Systems					
ATS 205	Alternative Soil Absorption Systems					
Installation & Inspection:						
Install 100	Installation of Gravity Systems	X				
Install 101	Installation Field Practicum		X		X	
Install 110	Construction Inspections BMP's for Onsite Systems					
Install 201/202	Installation Techniques for Gravelless Trench Technology					
Install 203/204	Installation Techniques for Fixed Media Technology					
Install 205	Installation Techniques for Wetland System Technology					
Install 206/207	Installation Techniques for Suspended Growth Technology					

Install 208	Installation Techniques for Mound System Technology					
Install 300	Installation & Inspection of Large Onsite & Communal Systems					
Operation, Monitoring & Maintenance:						
O&M 100	Subsurface Wastewater System Operator Training School		X		X	
O&M 101	Subsurface System Operator Refresher Course: LPP Systems					X
O&M 102	Subsurface System Operator Refresher Course: Fixed Media					X
O&M 103	Subsurface System Operator Refresher Course: Drip Systems					X
O&M 104	Pretreatment System O&M				X	
O&M 105	Sampling Smartly				X	
O&M 106	Subsurface System Operator Refresher Course: Suspended Media					X
O&M 107	Basic First-Aid & Bloodborne Pathogens	X				
O&M 108	Buried Utilities & Trench Safety	X				
O&M 109	Confined Space & Trench Safety	X				
O&M 110	Equipment Operation & Safety	X				
O&M 200	Inspection, Monitoring & O&M Field Practicum					X
O&M 201	Septic Tank Pumping, Cleaning Laterals and Other Lines				X	
O&M 203	Large System O&M					X
O&M 204	Composting Operations					X
O&M 205	Landfarm Operations					X
O&M 206	Biosolids Processing: Advanced Composting Techniques					
O&M 207	Biosolids Processing: Advanced Landfarming Techniques					
Troubleshooting & Repair:						
Repair 100	Principles of Troubleshooting: Small Systems		X		X	
Repair 101	Troubleshooting: Case Studies for Small Systems				X	
Repair 140	Control System Troubleshooting				X	
Repair 150	Principles of Troubleshooting: Large Systems				X	
Repair 200	Advanced Troubleshooting: Small Systems					X
Repair 210	Advanced Troubleshooting: Large Systems					X
Business Management:						
Business 100	Operator Responsibilities, Ethics, and Duties	X				
Business 101	Business Planning for Installers		X			X
Business 102	Cost Estimation Methods for System Installation	X				
Business 150	Time-of-Sale Inspections: Basics of Monitoring				X	
Business 151	Time-of-Sale Inspections: Alternative & Innovative Systems					X
Business 205	Business Issues for Operators and Service Professionals			X		X

Requirements for Installer and Service Professional Certifications:

Installer I – Completion of Installer I courses.
Installer II – Installer I Certification; completion of Installer II courses.
Installer III – Installer II Certification; completion of Installer III courses.
Service Pro I – Installer I Certification; completion of Service Pro I courses.
Service Pro II – Service Pro I Certification; completion of Service Pro 1I courses.

For future consideration: Programs of study allow for defining mandatory courses and electives. It may also be appropriate to incorporate a plan for substituting or allowing credit for previous coursework or experience for specific courses. Technology specializations can also be developed from within Installer III courses, or additional ATS, INSTALL, or other higher-level courses included on the list but not defined for a specific certification at this time (i.e. Wetlands Specialist).

PRACTITIONER PROGRAMS OF STUDY
(System Inspectors – Regulatory or Private)

COURSE NUMBER	COURSE TITLE	PRACTITIONER MODULES				
Septic System Basics:		**Inspector I**	**Inspector II**	**Inspector III**		
Septic 1	Your Onsite Wastewater Treatment System- A Homeowners Manual	X				
Septic 2	Community Choices		X			
Septic 3	Drinking Water Well & Septic Systems for Real Estate		X			
Septic 100	Planning Development Using the Decentralized Technology Approach			X		
Septic 101	Community Wastewater Needs Assessment			X		
Septic 201	Wastewater & the Environment			X		
	A Kentucky Homeowner's Guide to Septic Systems (handout)	X				
	Ky. Onsite Sewage Disposal Systems Regulation (handout)	X				
	Guide to Onsite Wastewater & New Construction (handout)	X				
	So, You Want to Build A House (handout)	XX				
Onsite Wastewater Overview:						
Onsite 100	Basics of Onsite Sewage	X				
Onsite 101	Introduction to Soils & Site Evaluation	X				
Onsite 102	Onsite System Technologies	X				
Onsite 103	Kentucky Onsite Regulations	X				
Onsite 104	Onsite System Components	X				
Onsite 105	Mathematics for Subsurface System Operators					
Onsite 110	Septic Tanks & Effluent Filters	X				
Onsite 111	Gravity Distribution Systems	X				
Onsite 112	Pump Systems		X			
Onsite 120	Pretreatment Overview		X			
Onsite 130	Introduction to Drip Irrigation		X			
Onsite 140/141	Introduction to Wastewater Microbiology & Chemistry	X				
Onsite 150	Introduction to Disinfection Systems			X		
Onsite 200	Septic System Options for Difficult Sites		X			
Onsite 202	High Strength & Commercial Wastewater			X		
Onsite 280	Advanced Wastewater Biology & Chemistry					
Onsite 290	Advanced Wastewater Disinfection					
Site and Soil Evaluation:						
Soils 100	Getting the Dirt on Soils	X				
Soils 101	Field Description of Soil Morphology	X				
Soils 102	Soil Wetness & Water Table Relationships	X				
Soils 103	Soil Structure	X				
Soils 104	Soil Texture	X				

Soils 105	Site Conditions & Landscape Assessment	X				
Soils 110	Water Movement & Treatment in Soils	X				
Soils 200	Matching the System to the Soil: Integrating Soil Morphology w/ Land Needs	X				
Soils 201	Soil Consistence, Mineralogy and Expansive Characteristics			X		
Soils 202	Saturated Hydraulic Conductivity as a Site Evaluation Tool			X		
Soils 203	Assessment of Water Flow at Sites Proposed for Large Capability of Soils		X			
Soils 204	Use of Computer Models to Predict Drainage Capability of Soils					
Soils 205	Site Evaluation of Saprolite			X		
Soils 210	Site Evaluation of Restrictive Horizons		X			
Soils 220	Lab Analysis of Soils Properties					
Soils 300	Soils of the Southeastern U.S. Region			X		
Soils 310	Soil Site Evaluation for Septic Systems		X			
System Design & Engineering:						
Design 099	Basic Conventional OWTS Design	X				
Design 100	Principles of Design	X				
Design 101	Best Management Practices for Design			X		
Design 200	Pump and System Design		X			
Design 201	Control Systems		X			
Design 202	Low-Pressure Piping Systems			X		
Design 203	Drip Irrigation System Design			X		
Design 204	Spray Irrigation System Design					
Design 240	Mound and At-Grade System Design		X			
Design 260	Advanced Pretreatment System Design			X		
Design 270	Design & Use of Disinfection Systems					
Design 280	Water Re-use Systems			X		
Design 300	Large System Design			X		
Design 301	Design Collaborative Workshop			X		
Design 310	Applied Hydraulics			X		
Alternative Treatment Systems:						
ATS 100/101	Onsite WastewaterTechnology Overview	X				
ATS 200	Wetland Treatment Systems		X			
ATS 201	Sandfilter Treatment Systems			X		
ATS 202	Recirculating Gravel Treatment Systems			X		
ATS 203	Fixed Media Treatment Systems			X		
ATS 204	Suspended Growth Treatment Systems			X		
ATS 205	Alternative Soil Absorption Systems		X			
Installation & Inspection:						
Install 100	Installation of Gravity Systems	X				
Install 101	Installation Field Practicum	X				
Install 110	Construction Inspections BMP's for Onsite Systems		X			
Install 201/202	Installation Techniques for Gravelless Trench Technology					
Install 203/204	Installation Techniques for Fixed Media Technology					
Install 205	Installation Techniques for Wetland System Technology					
Install 206/207	Installation Techniques for Suspended Growth Technology					

Install 208	Installation Techniques for Mound System Technology					
Install 300	Installation & Inspection of Large Onsite & Communal Systems			X		
Operation, Monitoring & Maintenance:						
O&M 100	Subsurface Wastewater System Operator Training School		X			
O&M 101	Subsurface System Operator Refresher Course: LPP Systems					
O&M 102	Subsurface System Operator Refresher Course: Fixed Media					
O&M 103	Subsurface System Operator Refresher Course: Drip Systems					
O&M 104	Pretreatment System O&M		X			
O&M 105	Sampling Smartly			X		
O&M 106	Subsurface System Operator Refresher Course: Suspended Media					
O&M 107	Basic First-Aid & Bloodborne Pathogens	X				
O&M 108	Buried Utilities & Trench Safety	X				
O&M 109	Confined Space & Trench Safety	X				
O&M 110	Equipment Operation & Safety	X				
O&M 200	Inspection, Monitoring & O&M Field Practicum		X			
O&M 201	Septic Tank Pumping, Cleaning Laterals and Other Lines					
O&M 203	Large System O&M					
O&M 204	Composting Operations					
O&M 205	Landfarm Operations					
O&M 206	Biosolids Processing: Advanced Composting Techniques					
O&M 207	Biosolids Processing: Advanced Landfarming Techniques					
Troubleshooting & Repair:						
Repair 100	Principles of Troubleshooting: Small Systems	X				
Repair 101	Troubleshooting: Case Studies for Small Systems		X			
Repair 140	Control System Troubleshooting	X				
Repair 150	Principles of Troubleshooting: Large Systems		X			
Repair 200	Advanced Troubleshooting: Small Systems			X		
Repair 210	Advanced Troubleshooting: Large Systems			X		
Business Management:						
Business 100	Operator Responsibilities, Ethics, and Duties					
Business 101	Business Planning for Installers					
Business 102	Cost Estimation Methods for System Installation					
Business 150	Time-of-Sale Inspections: Basics of Monitoring	X				
Business 151	Time-of-Sale Inspections: Alternative & Innovative Systems	X				
Business 205	Business Issues for Operators and Service Professionals			X		

Requirements for Inspector Certifications:

Inspector I – Completion of Inspector I courses.
Inspector II – Inspector I Certification; completion of Inspector II courses.
Inspector III – Inspector II Certification; completion of Inspector III courses.

For future consideration: Programs of study allow for defining mandatory courses and electives. It may also be appropriate to incorporate a plan for substituting or allowing credit for previous coursework or experience for specific courses. Onsite Designer, Engineer or other certifications can be developed from listed courses.

PUBLIC & PRIVATE SECTOR EDUCATION

PUBLIC & PRIVATE SECTOR EDUCATION

Overview

KOWA recognizes that an effective system of education and outreach addressing onsite wastewater disposal as a NPS pollution issue reaches beyond industry practitioners. As many rural and semi-rural citizens in Kentucky currently and will continue to rely on decentralized wastewater treatment systems due to logistics and affordability, it is important to educate those parties who influence community decision-making, as well as those who utilize these systems.

The "public sector" can be most simply defined as those individuals involved in community decision-making roles. They are employed in local, district or state agencies or they volunteer on local planning committees. These individuals may include, but are not limited to, public health department administrators, local fiscal court officials (county judge executives and magistrates), waste management directors and employees, planning and zoning administrators and committee members. Message objectives must be designed to raise the level of public awareness of wastewater and NPS pollution issues and its effects locally in terms of community and personal impacts, ranging from economic concerns to protection of public health.

The "private sector" might be defined as those individuals who affect or can be affected by onsite wastewater disposal issues in the course of their business or personal use of a decentralized wastewater treatment system. These individuals include lenders/bankers, realtors, developers, homebuilders, and homeowners. Message objectives to private sector groups must be designed to raise awareness of proper onsite sewage treatment and disposal, as well as the value of proper onsite wastewater disposal in terms of personal economics, local impacts, and public health.

Programs and materials designed for public and private sector groups will be of a different purpose and nature than those designed specifically for the onsite practitioner. Preliminary materials have been developed from a variety of sources for distribution as public information materials. A few targeted courses from the Practitioner Education curriculum are applicable to these groups as well. Other planned or recommended courses are based on CIDWT materials as indicated earlier. Courses will be taught as stand-alone informational trainings, not as part of a certification curriculum program. Course approval should be sought from appropriate state or local agencies to meet annual continuing education requirements for public sector, real estate, and banking participants in order to enhance their appeal to these audiences.

PUBLIC & PRIVATE SECTOR PROGRAMS OF STUDY
(Varied Audiences)

COURSE NUMBER	COURSE TITLE	COURSES AND MATERIALS				
Septic System Basics:		**Public Sector**	**Real Estate**	**Lenders**	**Homeowners**	
Septic 1	Your Onsite Wastewater Treatment System- A Homeowners Manual		X		X	
Septic 2	Community Choices	X	X			
Septic 3	Drinking Water Well & Septic Systems for Real Estate		X	X		
Septic 100	Planning Development Using the Decentralized Technology Approach	X	X	X		
Septic 101	Community Wastewater Needs Assessment	X	X	X		
Septic 201	Wastewater & the Environment	X	X	X	X	
	A Kentucky Homeowner's Guide to Septic Systems (handout)	X	X	X	X	
	Ky. Onsite Sewage Disposal Systems Regulation (handout)	X	X	X		
	Guide to Onsite Wastewater & New Construction (handout)	X	X	X		
	So, You Want to Build A House (handout)	X	X	X	X	
Onsite Wastewater Overview:						
Onsite 100	Basics of Onsite Sewage	X	X	X	X	
Onsite 101	Introduction to Soils & Site Evaluation		X			
Onsite 102	Onsite System Technologies	X	X	X	X	
Onsite 103	Kentucky Onsite Regulations					
Onsite 104	Onsite System Components					
Onsite 105	Mathematics for Subsurface System Operators					
Onsite 110	Septic Tanks & Effluent Filters					
Onsite 111	Gravity Distribution Systems					
Onsite 112	Pump Systems					
Onsite 120	Pretreatment Overview					
Onsite 130	Introduction to Drip Irrigation					
Onsite 140/141	Introduction to Wastewater Microbiology & Chemistry					
Onsite 150	Introduction to Disinfection Systems					
Onsite 200	Septic System Options for Difficult Sites					
Onsite 202	High Strength & Commercial Wastewater					
Onsite 280	Advanced Wastewater Biology & Chemistry					
Onsite 290	Advanced Wastewater Disinfection					
Site and Soil Evaluation:						
Soils 100	Getting the Dirt on Soils		X			
Soils 101	Field Description of Soil Morphology					
Soils 102	Soil Wetness & Water Table Relationships					
Soils 103	Soil Structure					
Soils 104	Soil Texture					
Soils 105	Site Conditions & Landscape Assessment		X			

Soils 110	Water Movement & Treatment in Soils					
Soils 200	Matching the System to the Soil: Integrating Soil Morphology w/ Land Needs					
Soils 201	Soil Consistence, Mineralogy and Expansive Characteristics					
Soils 202	Saturated Hydraulic Conductivity as a Site Evaluation Tool					
Soils 203	Assessment of Water Flow at Sites Proposed for Large Capability of Soils					
Soils 204	Use of Computer Models to Predict Drainage Capability of Soils					
Soils 205	Site Evaluation of Saprolite					
Soils 210	Site Evaluation of Restrictive Horizons					
Soils 220	Lab Analysis of Soils Properties					
Soils 300	Soils of the Southeastern U.S. Region					
Soils 310	Soil Site Evaluation for Septic Systems					
System Design & Engineering:						
Design 099	Basic Conventional OWTS Design					
Design 100	Principles of Design		X			
Design 101	Best Management Practices for Design					
Design 200	Pump and System Design					
Design 201	Control Systems					
Design 202	Low-Pressure Piping Systems					
Design 203	Drip Irrigation System Design					
Design 204	Spray Irrigation System Design					
Design 240	Mound and At-Grade System Design					
Design 260	Advanced Pretreatment System Design					
Design 270	Design & Use of Disinfection Systems					
Design 280	Water Re-use Systems					
Design 300	Large System Design					
Design 301	Design Collaborative Workshop					
Design 310	Applied Hydraulics					
Alternative Treatment Systems:						
ATS 100/101	Onsite WastewaterTechnology Overview	X	X			
ATS 200	Wetland Treatment Systems				X	
ATS 201	Sandfilter Treatment Systems				X	
ATS 202	Recirculating Gravel Treatment Systems				X	
ATS 203	Fixed Media Treatment Systems				X	
ATS 204	Suspended Growth Treatment Systems				X	
ATS 205	Alternative Soil Absorption Systems				X	
Installation & Inspection:						
Install 100	Installation of Gravity Systems					
Install 101	Installation Field Practicum					
Install 110	Construction Inspections BMP’s for Onsite Systems					
Install 201/202	Installation Techniques for Gravelless Trench Technology					
Install 203/204	Installation Techniques for Fixed Media Technology					
Install 205	Installation Techniques for Wetland System Technology					
Install 206/207	Installation Techniques for Suspended Growth Technology					
Install 208	Installation Techniques for Mound System Technology					

Install 300	Installation & Inspection of Large Onsite & Communal Systems					
Operation, Monitoring & Maintenance:						
O&M 100	Subsurface Wastewater System Operator Training School					
O&M 101	Subsurface System Operator Refresher Course: LPP Systems				X	
O&M 102	Subsurface System Operator Refresher Course: Fixed Media				X	
O&M 103	Subsurface System Operator Refresher Course: Drip Systems				X	
O&M 104	Pretreatment System O&M					
O&M 105	Sampling Smartly					
O&M 106	Subsurface System Operator Refresher Course: Suspended Media				X	
O&M 107	Basic First-Aid & Bloodborne Pathogens					
O&M 108	Buried Utilities & Trench Safety					
O&M 109	Confined Space & Trench Safety					
O&M 110	Equipment Operation & Safety					
O&M 200	Inspection, Monitoring & O&M Field Practicum					
O&M 201	Septic Tank Pumping, Cleaning Laterals and Other Lines					
O&M 203	Large System O&M					
O&M 204	Composting Operations					
O&M 205	Landfarm Operations					
O&M 206	Biosolids Processing: Advanced Composting Techniques					
O&M 207	Biosolids Processing: Advanced Landfarming Techniques					
Troubleshooting & Repair:						
Repair 100	Principles of Troubleshooting: Small Systems					
Repair 101	Troubleshooting: Case Studies for Small Systems					
Repair 140	Control System Troubleshooting					
Repair 150	Principles of Troubleshooting: Large Systems					
Repair 200	Advanced Troubleshooting: Small Systems					
Repair 210	Advanced Troubleshooting: Large Systems					
Business Management:						
Business 100	Operator Responsibilities, Ethics, and Duties		X			
Business 101	Business Planning for Installers					
Business 102	Cost Estimation Methods for System Installation					
Business 150	Time-of-Sale Inspections: Basics of Monitoring					
Business 151	Time-of-Sale Inspections: Alternative & Innovative Systems					
Business 205	Business Issues for Operators and Service Professionals					

Public Outreach Courses of Study:

Courses for public and private sector individuals and groups are designed as "non-certification" courses. They are designed to increase individual knowledge on specific topics of interest to the individual. The courses suggested above are those thought to be of particular value to various target audiences, however, any developed course from the complete listing can be made available to any group on request.

CURRICULUM AND OUTREACH MATERIALS

LONG-RANGE CURRICULUM DEVELOPMENT PLAN

Number	Title	Original Source	Draft Status	319(h) Grant Submission Status	Comments
Septic System Basics:					
Septic 1	Your Onsite Wastewater Treatment System- A Homeowners Manual	CIDWT Univ (Tanks) Ky. DPH NSF	Inst & Student Manuals completed. PowerPoint (PPT) completed.	Approved DOW DPH – N/A	Committee to consider potential as "on-line" course posted on website. Committee to discuss distribution to all Kentucky counties.
Septic 2	Community Choices				
Septic 3	Drinking Water Well & Septic Systems for Real Estate				
Septic 100	Planning Development Using the Decentralized Technology Approach				
Septic 101	Community Wastewater Needs Assessment				
Septic 201	Wastewater & the Environment				
	A Kentucky Homeowner's Guide to Septic Systems	U.S. EPA	1st printing completed Revised 7/06	Approved DOW Approved DPH	1st printing-5,000 Revised – 10,000 Posted Website.
	Ky. Onsite Sewage Disposal Systems Regulation	KAR	KP-revised cover sheet 7/06	Reprint of KAR statutes; no drafts or writing involved	1st printing-500 2nd – 1000 Revised - 2,000 Posted Website.
	Guide to Onsite Wastewater & New Construction	Ky. CHFS & Ky. EPA	Added "Printed by KOWA" statement 7/06	Developed by DOW/DPH; reprinted at DOW request	Printed 5,000 Posted Website.
	So, You Want to Build A House	Ky. CHFS & Ky. EPA	Added "Printed by KOWA" statement 7/06	Developed by DOW/DPH; reprinted at DOW request	Printed 5,000 Posted Website.
	Onsite Wastewater Facts: System Inspections	NSF	Preliminary Draft		
	Home Aerobic Wastewater Treatment		Completed & published under EPA Grant	N/A	Supply depleted. Posted Website.
Onsite Wastewater Overview:					
Onsite 100	Basics of Onsite Sewage				
Onsite 101	Introduction to Soils & Site Evaluation	CIDWT Practitioner (Soil/Site) WV Class I Course	Inst & Student Manuals Completed. PPT completed.	Approved DOW Approved DPH (DPH#99-55)	
Onsite 102	Onsite System Technologies				
Onsite 103	Kentucky Onsite				

	Regulations				
Onsite 104	Onsite System Components				
Onsite 105	Mathematics for Subsurface System Operators				
Onsite 110	Septic Tanks & Effluent Filters	CIDWT Pract. & University (Septic Tank)	Inst & Student Manuals Completed. PPT completed.	Approved DOW Approved DPH (DPH#99-56)	
Onsite 111	Gravity Distribution Systems				
Onsite 112	Pump Systems				
Onsite 120	Pretreatment Overview				
Onsite 130	Introduction to Drip Irrigation	CIDWT University Module – Drip Dispersal	Portions drafted. PPTs drafted.		
Onsite 140/141	Introduction to Wastewater Microbiology & Chemistry	WV Class I NC Guidance Manual	Inst & Student Manuals Completed. PPT completed.	Approved DOW Submitted DPH 9/07	
Onsite 150	Introduction to Disinfection Systems				
Onsite 200	Septic System Options for Difficult Sites			PPT Approved DPH (Approval #99-51)	KOWA PPT "Overcoming Site Limitations"
Onsite 202	High Strength & Commercial Wastewater				
Onsite 280	Advanced Wastewater Biology & Chemistry				
Onsite 290	Advanced Wastewater Disinfection				
Site and Soil Evaluation:					
Soils 100	Getting the Dirt on Soils				
Soils 101	Field Description of Soil Morphology				
Soils 102	Soil Wetness & Water Table Relationships				
Soils 103	Soil Structure				
Soils 104	Soil Texture				
Soils 105	Site Conditions & Landscape Assessment				
Soils 110	Water Movement & Treatment in Soils	CIDWT Pract Water Move.& Soil Trtmt	To adapt from full CIDWT module		PPTs drafted. To review – CIDWT PPT better than draft.
Soils 200	Matching the System to the Soil: Integrating Soil Morphology w/ Land Needs				
Soils 201	Soil Consistence, Mineralogy and				

	Expansive Characteristics				
Soils 202	Saturated Hydraulic Conductivity as a Site Evaluation Tool				
Soils 203	Assessment of Water Flow at Sites Proposed for Large Capability of Soils				
Soils 204	Use of Computer Models to Predict Drainage Capability of Soils				
Soils 205	Site Evaluation of Saprolite				
Soils 210	Site Evaluation of Restrictive Horizons				
Soils 220	Lab Analysis of Soils Properties				
Soils 300	Soils of the Southeastern U.S. Region				
Soils 310	Soil Site Evaluation for Septic Systems				
System Design & Engineering:					
Design 099	Basic Conventional OWTS Design	CIDWT WV Class I	Inst & Student Manuals Completed. PPT completed.	Approved DOW Approved DPH (DPH #99-54)	
Design 100	Principles of Design				
Design 101	Best Management Practices for Design				
Design 200	Pump and System Design				
Design 201	Control Systems				
Design 202	Low-Pressure Piping Systems	WV Class II Course	Inst & Student Manuals Completed. PPT completed.	Approved DOW Submitted DPH 9/07	
Design 203	Drip Irrigation System Design	CIDWT University (Drip) WV Class II	Portions drafted. PPTs drafted.		
Design 204	Spray Irrigation System Design				
Design 240	Mound and At-Grade System Design	WVU CIDWT	Portions drafted.		
Design 260	Advanced Pretreatment System Design				
Design 270	Design & Use of Disinfection Systems				
Design 280	Water Re-use Systems				
Design 300	Large System Design				
Design 301	Design Collaborative Workshop				
Design 310	Applied Hydraulics				
Alternative Treatment Systems:					

ATS 100/101	Onsite Wastewater Technology Overview	CIDWT Pract. Tech Overview	Inst & Student Manuals Complete. PPT completed.	Approved DOW Approved DPH (prior to DPH # system)	Manual posted on Website.
ATS 200	Wetland Treatment Systems				
ATS 201	Sandfilter Treatment Systems				
ATS 202	Recirculating Gravel Treatment Systems				
ATS 203	Fixed Media Treatment Systems				
ATS 204	Suspended Growth Treatment Systems				
ATS 205	Alternative Soil Absorption Systems				
Installation & Inspection:					
Install 100	Installation of Gravity Systems				
Install 101	Installation Field Practicum				
Install 110	Construction Inspections BMP's for Onsite Systems				
Install 201/202	Installation Techniques for Gravelless Trench Technology				
Install 203/204	Installation Techniques for Fixed Media Technology				
Install 205	Installation Techniques for Wetland System Technology				
Install 206/207	Installation Techniques for Suspended Growth Technology				
Install 208	Installation Techniques for Mound System Technology				
Install 300	Installation & Inspection of Large Onsite & Communal Systems				
Operation, Monitoring & Maintenance:					
O&M 100	Subsurface Wastewater System Operator Training School				
O&M 101	Subsurface System Operator Refresher Course: LPP Systems				
O&M 102	Subsurface System Operator Refresher Course: Fixed Media				

O&M 103	Subsurface System Operator Refresher Course: Drip Systems				
O&M 104	Pretreatment System O&M				
O&M 105	Sampling Smartly				
O&M 106	Subsurface System Operator Refresher Course: Suspended Media				
O&M 107	Basic First-Aid & Bloodborne Pathogens				
O&M 108	Buried Utilities & Trench Safety				
O&M 109	Confined Space & Trench Safety				
O&M 110	Equipment Operation & Safety				
O&M 200	Inspection, Monitoring & O&M Field Practicum				
O&M 201	Septic Tank Pumping, Cleaning Laterals and Other Lines				
O&M 203	Large System O&M				
O&M 204	Composting Operations	WKU/UK/CKTC	Inst & Student Manuals Complete	Approved DOW	PPT to be updated to match final manual.
O&M 205	Land Application Operations	UK/DWM/CKTC	Inst. & Student Manuals Complete	Approved DOW	PPT to be updated to match final manual.
O&M 206	Biosolids Processing: Advanced Composting Techniques				
O&M 207	Biosolids Processing: Advanced Landfarming Techniques				
Troubleshooting & Repair:					
Repair 100	Principles of Troubleshooting: Small Systems				
Repair 101	Troubleshooting: Case Studies for Small Systems				
Repair 140	Control System Troubleshooting				
Repair 150	Principles of Troubleshooting: Large Systems				
Repair 200	Advanced Troubleshooting: Small Systems				
Repair 210	Advanced Troubleshooting: Large Systems				

Business Management:					
Business 100	Operator Responsibilities, Ethics, and Duties				
Business 101	Business Planning for Installers				
Business 102	Cost Estimation Methods for System Installation				
Business 150	Time-of-Sale Inspections: Basics of Monitoring				
Business 151	Time-of-Sale Inspections: Alternative & Innovative Systems				
Business 205	Business Issues for Operators and Service Professionals				

COURSE DESCRIPTIONS

Septic System Basics and Planning

The general public knows little about management of onsite wastewater treatment systems, and they are not aware of the options that exist for rural and suburban wastewater management. The Septic System Basics course series is intended to provide an entry point into the Model Curriculum Plan for homeowners, landowners, rural community leaders, rural industry leaders, realtors, lenders, builders, planners, developers, landscapers, and other professionals outside the onsite wastewater industry.

SEPTIC 1: Your Onsite Wastewater Treatment System

This introductory course describes the basic septic system and its typical modifications. The course will help homeowners understand how their system works and what they need to do to maintain its effective operation for the long term. This course provides information on the basic function and operation of the septic tank and disposal components of the conventional onsite system. The course includes information needed for homeowners to properly care for their systems and recognize problem that may result from misuse. Presentations will focus on the components, installation, maintenance, and regulatory requirements of the primary treatment technologies. This course largely relates to primary treatment technologies commonly used by the individual homeowner.

SEPTIC 2: Community Choices

This introductory course describes how decentralized systems can be a permanent wastewater infrastructure option for local communities when used with centralized management. It compares the use, environmental impacts and costs of decentralized and centralized (sewers) wastewater treatment technologies.

SEPTIC 3: Drinking Water Well and Septic Systems for Real Estate

Real estate agents are responsible for providing their clients with the best consumer information possible about the value of specific properties. The condition and maintenance of a well and/or septic system is crucial to determining the value of a property and its suitability for residents. Discovery of a poorly maintained well or septic system after closing on a property can be disastrous for the buyer and the real estate agent alike. This course describes typical onsite wastewater systems and water supply systems. It presents red flags to help realtors and others determine if septic systems and wells are functioning correctly, or if not, to identify potential problems regarding the well or septic system that need to be resolved.

SEPTIC 100: Planning Development Using the Decentralized Technology Approach

This course illustrates how to incorporate decentralized systems into community planning and into the subdivision development process. It illustrates basic principles, use of technologies and management approaches. Case studies of the development planning process illustrate how property use can be maximized by careful attention to technology selection and matching the technology selection and subdivision design process with the soil/land resources at a site.

SEPTIC 101: Community Wastewater Needs Assessment
The course provides a methodology to determine the wastewater needs of a community through an objective scientific process that provides insight to community leaders and helps them recognize important local environmental issues as well as identify critical receiving environments that need special protection from pollutants.

SEPTIC 201: Wastewater and the Environment
Wastewater contains significant types and levels of pollutants. These include oxygen consuming substances, organic chemicals, metals, pathogens, nutrients, and emerging pollutants such as endocrine disrupting compounds such as hormones and others. This one-day course reviews the types of pollutants, typical levels of contamination and pathways for exposure to humans and the pollution of the environment. Both decentralized and centralized system failure rates and causes of failure are covered. The potential impacts of centralized and decentralized systems on water supply, water recharge, and environmental degradation are compared and contrasted.

Onsite Wastewater Overview

As more communities depend upon decentralized wastewater treatment systems, the technologies in use have become increasingly more complex resulting in the need for better training. The ONSITE 100 series of courses is the entry point into the Model Practitioner Curriculum for the practicing onsite wastewater professional. Proceeding through the ONSITE 200 and 300 series of courses and conferences, field practitioners can progressively increase their knowledge and ability to meet the needs of their customers or clients. These more intensive courses provide a foundation for all parts of the onsite professional team from the site evaluator and designer to the installer, inspector, pumper, manufacturer, and operator. The ONSITE series lays a common groundwork for soils, design, installation, and maintenance courses that are more specialized within a given area of expertise.

ONSITE 100: Basics of Onsite Sewage

ONSITE 101: Introduction to Soils and Site Evaluation

This introductory course describes the basic concepts of soil and site evaluation. It will help the practitioner understand how soils and sites are evaluated. This course provides information on soil characteristics and site features related to onsite wastewater systems and disposal components. The course includes information needed for the practitioner to properly evaluate soils and site conditions and recognize problems that may result from an improper evaluation. Presentations will focus on Kentucky's soil and site evaluation requirements.

ONSITE 102: Onsite System Components

ONSITE 103: Kentucky Onsite Regulations

This course is a comprehensive introduction to the onsite sewage code, structure of the rules, and requirements of the enabling legislation. It encompasses the material contained in the current revision of the "Kentucky Onsite Sewage Systems Regulation."

ONSITE 105: Onsite System Components

ONSITE 104: Mathematics for Subsurface System Operators

ONSITE 110: Septic Tanks and Effluent Filters
This course is an introduction to the design, construction, and installation of septic tanks and effluent filters used for conventional onsite wastewater treatment systems. The course describes the criteria for selection of the appropriate components and installation procedures. This course primarily relates to technologies used for single-family onsite wastewater systems.

ONSITE 111: Gravity Distribution Systems

ONSITE 112: Pump Systems

ONSITE 120: Pretreatment overview
As the soils best suited to conventional systems are developed, increasing areas of soils marginally suited to the conventional septic system are used for land development. Although these soils may be limited for the use of conventional systems, these same soils may be very well suited to onsite systems that incorporate pretreatment. This course reviews pretreatment systems designed to reduce organic strength and pathogens as well as those targeting nutrient reduction.

ONSITE 130: Introduction to drip irrigation
This course provides a comprehensive overview of drip irrigation technology, the critical components of these systems such as filters, pumps, valves, gauges, manifolds, drip tubing, emitters, and return lines. Use of the technology from all viewpoints (siting and design to construction, inspection, operation, and maintenance) is addressed in the classroom with examples provided during a field visit to a functional system. Operational needs and field troubleshooting are also addressed.

ONSITE 140/141: Introduction to Wastewater Microbiology & Chemistry
This introductory course describes the basic concepts of wastewater microbiology and chemistry. This course will help the practitioner better understand how an onsite system works and how to maintain its function for the long term. This course provides information on the basic biological and chemical functions of onsite wastewater system and disposal components. The course includes information needed for the designer, installer, and inspector to properly manage the system and recognize problems that may result from misuse. Presentations will focus on the biological and chemical processes

occurring in the system. This course primarily relates to treatment technologies used by individual homeowner systems and decentralized cluster systems.

ONSITE 150: Introduction to Disinfection Systems

ONSITE 200: Septic System Options for Difficult Sites
While a substantial number of new onsite technologies have come into the marketplace in the past 15 years, the utilization of these technologies has been irregular across North America. This course will help health agents, onsite consultants, developers and community leaders learn how to identify the correct solutions to match with difficult site conditions. The student will learn how to determine the most appropriate technology options for difficult sites that have limitations due to landscape position or topography, soil morphology (texture, structure, or mineralogy limitations), soil wetness, soil depth, restrictive horizons, limited space, and horizontal setbacks.

ONSITE 202: High Strength & Commercial Wastewater
Restaurants and other commercial or industrial facilities often produce high strength wastewater that requires advanced handling and treatment beyond that typically used for residential wastewater. This one to two-day short course introduces the student to FOG (fat, oil, and grease) concepts and impacts upon onsite systems, grease interceptor options and their maintenance, and advanced pretreatment units that are targeted to high strength wastewater issues.

ONSITE 280: Advanced Wastewater Biology & Chemistry

ONSITE 290: Advanced Wastewater Disinfection

Site and Soil Evaluation

Predicting the behavior and function of soil, through its morphology *in-situ* (in place) within its natural landscape, is central to the practice of soil science. Proficiency in these skills is crucial to onsite wastewater practitioners who determine site suitability for decentralized systems. These soils and site evaluation workshops are designed to this end. Beginning with the Soils 100 series and moving through the Soils 200 series and Soils 300, one's ability to understand relationships between soil properties and behavior of the functioning onsite wastewater treatment system is improved. The Soils 310 course is a capstone course intended to be a field practicum assessment of the students' knowledge, skills, and abilities in soil and site evaluation. It is critical that once siting goes beyond the traditional conventional systems or those that have simple siting solutions that the site evaluator has a soil scientist license, certification or educational experience and credentials as well as the training described in the following courses.

SOILS 100: Getting the Dirt on Soils
This one-day course introduces the concepts of soils and their observance in the field. Topics covered include the field characteristics of soils that are described in a

morphological description and an appreciation for how these characteristics can influence water movement and wastewater treatment in soils. Participants get an appreciation for the basics of field morphology such as soil texture, structure, color, and consistence.

SOILS 101: Field Description of Soil Morphology

This is a two-day short course that introduces participants to the "language of soils"; that is, the specific terminology used by soil scientists to describe soil profiles, and the landscapes they occur within, in the field. In addition to learning terminology, students will work in small teams and utilize soil monoliths and a field practicum approach to describe soil profiles and landscapes under the guidance of experienced soil scientists. Once this workshop is completed, the students should be able to make accurate descriptions of soil texture, structure, color, and consistence on a limited range of local soil types and be prepared to take more advanced soil description workshops.

SOILS 102: Soil Wetness and Water Table Relationships

Soil color is frequently used to determine soil wetness conditions. However, oftentimes, there are addition interpretations that can be made when actual water table monitoring data is available at a site. This one-day short course describes soil color, redoximorphic features, their causes, and interrelationships between redoximorphic features with both saturation and reduction in the soil profile. In addition, this short course illustrates field methodologies for site instrumentation using wells and piezometers and interpretation of water table monitoring data gathered through such monitoring networks.

SOILS 103: Soil Structure

This one-day short course covers the definitions, formation, features and characteristics of various soil structure and structureless conditions using the USDA soil structure description techniques. Students working in small teams or individually will utilize a multitude of soil samples observed in backhoe pits to determine structure type, size, and class and to determine suitability for onsite wastewater treatment systems. The potential adverse effects of onsite system construction and use on soil structure will be covered as well as methods to minimize adverse impacts.

SOILS 104: Soil Texture

Soil texture is often used as one of the primary soil characteristics to assist in determining loading rates for onsite systems. The effects of soil texture on water flow and treatment potential in onsite systems will be covered. Students will utilize bulk field-moist soil samples and dry, prepared soil samples that have been analyzed in the laboratory to calibrate their fingers during hand texturing of soils. After analyzing known samples students will utilize their texturing skills to determine the sand, silt, clay contents and particle size class of unknown samples. Finally, students in this one-day short course will be introduced to various particle-size scales used by soil scientists and engineers and discuss the two primary methods of determining particle size in the laboratory: the hydrometer method and the pipette method.

SOILS 105: Site Conditions and Landscape Assessment

This one-day short course addresses two major site evaluation themes: landscape position/and topography and site assessment issues that are not traditionally a part of soil assessments per se. Landscape position and the effects of slope percent, aspect, and topography on water convergence, divergence, and suitability of sites for onsite treatment systems are covered. Participants will learn to identify all major landscape positions. Topographic impacts on wastewater system suitability, performance, and appropriate loading rates (LTARs) will be addressed. Additionally, siting issues that are not soil-related are addressed. The basics of site mapping and plan preparation via use of survey tools and GPS systems are addressed. Participants will be able to develop simple site plans and the documentation that should accompany them. Finally, the impacts of other local county, state, provincial, or watershed-specific siting rules (e.g. Coastal zone management rules, buffer rules, special river basin rules) are discussed.

SOILS 110: Water Movement and Treatment in Soils

This is a half-day to one-day short course that addresses water movement in soils and the soil treatment processes that occur in onsite systems. The major topics addressed include saturated flow in soils, unsaturated flow in soils, soil treatment of wastewater and ground water mounding under onsite systems. One key part of this course is a video illustrating important water flow and soil treatment concepts. The effects of the biomat on water movement and wastewater treatment in an onsite system will be discussed. Participants will understand how water movement and soil treatment are interrelated and be introduced to use of Darcy's Law for saturated water flow in soils.

SOILS 200: Matching the system to the soil: Integrating soil morphology w/ land needs

This two-day short course will demonstrate how soil morphological characteristics can be used to assess land use needs by utilizing onsite wastewater treatment systems as an example. It is assumed that participants already have soil morphology description capabilities and an understanding of the technologies. In this course, they will use this knowledge to develop an advanced ability to match the correct onsite systems with the soil and landscape conditions at a particular site. Students will also learn how to utilize soil morphology to determine the correct loading rates, that is, the proper long-term acceptance rates (LTARs) for these technologies to properly determine onsite system size. The course addresses the differences between preliminary evaluations of land tracts and final site evaluations for assessing suitability. Finally, students utilize their abilities to match the system with the soil by conducting a field mapping exercise (working in small groups) of a subdivision-sized tract of land. The purposes are to learn 1) how to map onsite system suitability on multiple-acreage parcels that are intended as subdivisions and 2) to make the most efficient use of the available land.

SOILS 201: Soil Consistence, Mineralogy, and Expansive Characteristics

During this one day short course participants will develop an understanding of soil consistence and it's relationship to soil mineralogy including the similarities and differences between clay mineral structures and properties of 1:1 clay mineral systems, 2:1 clay mineral systems, and mixed mineralogy systems. Participants will be introduced to x-ray diffraction techniques and other analytical tools (apparent CEC, Atterberg limits,

COLE, etc) for determining mineralogy and evaluating the soil's expansive character when a soil field consistence assessment is inconclusive or challenged. Participants will develop an advanced understanding of how to use soil consistence and other morphological features to determine whether clayey and fine-loamy soils have expansive characteristics that would limit their suitability for use of onsite wastewater treatment systems and to determine appropriate loading rates (LTARs) for onsite systems.

SOILS 202: Saturated Hydraulic Conductivity as a Site Evaluation Tool
Participants will gain a working knowledge of *in situ* and laboratory methods for measuring saturated hydraulic conductivity (K_{sat}) in this one-day short course. Participants will be able to properly measure K_{sat} in the unsaturated zone (above a water table) using commercially available permeameters and be introduced to various models and approaches for calculating the K_{sat} values based on field measured data and interpreting the results for onsite system design professionals.

SOILS 203: Assessment of Water Flow at Sites Proposed for Large Onsite Systems
This advanced one to two-day short course will address use of soil morphology, saturated hydraulic conductivity tests and hydrogeological tests for assessing water flow at sites proposed for use of large onsite systems. The proper use of Darcy's Law and computer models for evaluating vertical and lateral flow during site assessments will be addressed as will methods to project the degree of ground water mounding likely to occur beneath proposed large, communal onsite systems.

SOILS 204: Use of Computer Models to Predict Drainage Capability of Soils
This advanced two-day short course will illustrate how to use advanced mathematical computer models such as Drainmod for determining sites drainage potential and for assessing long-term water table relationships based upon historical rainfall records, soil properties and drainage network design characteristics.

SOILS 205: Site Evaluation of Saprolite
This advanced short course will address field methods to determine suitability of saprolite for onsite systems. Participants will learn about the derivation of saprolite from hard rock, features and types of saprolite that commonly occur from various igneous and metamorphic rock types, as well as their occurrence and distribution on the landscape. Water flow, chemistry, and mineralogy of soils with saprolite layers will be addressed in this one to two-day short course and field assessment protocols will be demonstrated and tested by participants.

SOILS 210: Site Evaluation of Restrictive Horizons
This short course covers the range of restrictive horizons that interfere with downward water flow in soils and inhibit site suitability for most types of onsite systems. These types of soil horizons can include fragipans, densipans, claypans, caliche, petrocalcic horizons, petrogypsic horizons, petroferric horizons, ortstein, duripans, laterites, plinthite, and anthropogenic pans such as tillage pans, plow pans and hard pans. Characteristics of restrictive horizons vary according to region of the country; therefore, this one to two-day short course will focus in the field on those restrictive horizons that are common in the

locale of the short course. However, other restrictive horizons will be covered in less detail. The physical and chemical features of these pans will be addressed as well as use and management implications.

SOILS 220: Lab Analysis of Soil properties
Standard methods for laboratory determination of soil properties will be demonstrated in this one-day short course. Methods will be demonstrated for determining particle size analysis, CEC, COLE, X-ray diffraction, organic matter content, lab Ksat, porosity, soil moisture release curves, and other standard physical and chemical soil properties.

SOILS 300: Soils of the Southeastern U.S. Region
This will include a series of courses covering of soils of the southeast U.S., such as those listed below. In each short course the primary, or benchmark soil series of the region would be introduced using landscape-topographic diagrams, catena-diagrams, and "soil-trees" followed by field tours illustrating typical soils in the region. These courses focus upon a detailed understanding of soil properties, rather than on site suitability for onsite systems

SOILS 301: Soils of the Fall Zone and Outer Piedmont
SOILS 302: Soils of the Inner Piedmont
SOILS 303: Soils of the Low Mountains and Inter-Mountain Valleys
SOILS 304: Soils of the High Mountains
SOILS 305: Soils of the Upper Coastal Plain
SOILS 306: Soils of the Middle and Lower Coastal Plain
SOILS 307: Soils of the Tidewater Region and Barrier Island System

SOILS 310: Soil/Site Evaluation for Septic Systems
This three-day course will summarize and test the skills developed in previous short courses. On Day 1, students will work with the instructors to summarize their abilities and review problem scenarios during classroom and field discussions and assessments. Then, participants will take an individual field practicum test during days 2 and 3. They will use their soil assessment skills to assess raw tracts of land and determine site suitability for onsite systems, best system location, most appropriate types of systems to recommend for those sites, and loading rates. On the afternoon of day 3, the faculty will review the soil/site evaluations.

System Design and Engineering

The DESIGN short course series delves into the interaction of the many aspects embodied in the make-up and process of producing a successful onsite wastewater-recycling project. For entry-level engineering designers, the assessment and development of wastewater treatment solutions for onsite wastewater treatment may be perceived to be simplistic. After all, what can be complicated about the “age-old” septic system? However, as simple as one may perceive the problem to be, the solution is often a complex work effort to blend design with unique site conditions and the regulatory constraints imposed by the local, county, and/or state jurisdiction. This short course

series addresses topics ranging from basic design approaches to some of the most sophisticated engineering aspects of these systems and shares the professional experiences of a number of highly competent successful wastewater engineers.

DESIGN 099: Basic Conventional OWTS Design

This introductory course describes the basic design criteria for conventional onsite wastewater treatment systems. The course will help certified inspectors, installers and homeowners understand how systems are sized and designed under a variety of site situations. This course provides information on the sizing of septic tanks and lateral fields using Kentucky's regulatory requirements. Presentations will focus on the sizing techniques and common site conditions.

DESIGN 100: Principles of Design

This one-day short course covers the principles of onsite system design and the design basics for gravity distribution (conventional) septic systems that utilize either trenches or seepage beds. The advantages, disadvantages, and specific design attributes important to both serial and parallel distribution are covered. Design flow estimation methodologies including standard design flow and peak flow estimation tools are presented along with methods to estimate flow for non-residential systems. Septic tank sizing and design, selection and use of appurtenances and distribution devices, as well as trench layout and important soil issues are addressed. Participants will learn to design systems for difficult lots with limited space or site "barriers" that inhibit easy design. Participants will become familiar with sizing criteria for drainfields and with alternative trench designs including gravel-less trench materials and their use.

DESIGN 101: Best Management Practices for Design

Use of best management practices can help the designer assure that the most economical and best performing system is designed for a particular site. In this two and a half day course engineers and other designers will learn to use the following best management practices: 1) project scoping, 2) design team development, 3) facility assessment, 4) waste stream assessment, 5) site characterization, 6) permit application, 7) system selection, 8) process design, 9) cost estimation, 10) document preparation, and 11) quality assurance/quality control in construction. Each practice will be explained and examples given to facilitate participant learning. Students will then develop designs for selected site/facility scenarios except for the detailed "process design" parts that will be covered in later courses.

DESIGN 200: Pump and System Design

This one-day short course reviews the principles of onsite system design and focuses on control systems for pump distribution. The advantages, disadvantages, and specific design attributes important to pressure distribution are covered. Design flow estimation methodologies including standard design flow and peak flow estimation tools are reviewed along with methods to estimate flow for non-residential systems. Pump sizing, selection, and installation issues are stressed. Pump tank sizing and design will be addressed from the standpoint

of demand, timed-dose, and flow equalization regimes. Participants will become familiar with sizing criteria for pressure-dosed conventional and alternative drainfields.

DESIGN 201: Control Systems

This one-day short course reviews the principles of onsite system design and focuses on control systems for pump distribution. The advantages, disadvantages, and specific design attributes important to pressure distribution are reviewed. Source characterization is also reviewed; however, design flow estimation methodologies including standard design flow and peak flow estimation tools are covered in depth along with methods to estimate flow for non-residential systems. Pump tank sizing and design will be addressed from the standpoint of demand, timed-dose, and flow equalization regimes. Types of available pump controls are covered and the attributes compared. Proper installation techniques for control systems are covered in detail. Cost estimation examples and techniques for accurate installation inspection are also addressed.

DESIGN 202: Low-Pressure Piping systems

This introductory course describes the basic sizing, design, and installation concepts for low-pressure piping systems. The course will help the practitioner or others understand how the system works and how to maintain its effective, long-term operation. This course provides information on the basic function and operation of the low-pressure piping system and its major components. The course includes information needed for the onsite professional and the homeowner to properly care for the system and recognize problems that may result from misuse. Presentations will focus on the sizing, components, installation, maintenance, and regulatory requirements of the low-pressure piping system. This course largely relates to low-pressure piping systems used for an individual residence.

DESIGN 203: Drip Irrigation System Design

This one-day short course reviews the principles of onsite system design and focuses on design of Drip distribution systems. Permitting and site requirements are reviewed and regulatory requirements for monitoring and inspection are stressed. Source characterization is also briefly reviewed from the standpoint of Drip systems. Various soils loading rates will be covered as well as pump tank sizing and design from the standpoint of timed-dose and flow equalization regimes required for drip systems. A discussion of required system components is followed by a sample design exercise that will be reviewed in the classroom. Also included are discussions of cost estimation, installation inspection techniques, and creation of as-built drawings.

DESIGN 204: Spray Irrigation System Design

This one-day short course reviews the principles of onsite system design and focuses on design of Spray distribution systems. Permitting and site requirements are reviewed and regulatory requirements for monitoring and inspection are stressed. Source characterization is also briefly reviewed from the standpoint of Spray systems. Hydraulic and nutrient loading rates will be

covered as well as water storage requirements for spray systems and the importance of a vegetation management plan. A discussion of required system components is followed by a sample design exercise that will be reviewed in the classroom. Also included are discussions of cost estimation, installation inspection techniques, and creation of as-built drawings.

DESIGN 240: Mound and At Grade System Design

This one-day short course reviews the principles of onsite system design and focuses on design of Mound and At-grade systems. Permitting and site requirements are reviewed with emphasis on soil conditions that warrant use of this technology. Regulatory requirements for monitoring and inspection are covered, and source characterization is reviewed. Design flow estimation methods including standard design flow and peak flow estimation tools are presented along with methods to estimate flow for non-residential systems. Septic and pump tank sizing, design and selection and use of appurtenances and distribution devices are reviewed. Participants will become familiar with sizing criteria for Mound and At-grade drainfields and with alternative trench designs including gravel-less trench materials and their use. The importance of planning for site preparation prior to installation is stressed along with specifying final grading requirements. Also included are discussions of cost estimation, installation inspection techniques, and creation of as-built drawings.

DESIGN 260: Advanced Pretreatment System Design

This two-day short course reviews the principles of onsite system design and focuses on systems that use Advanced Pretreatment options. The treatment processes employed in pretreatment units will be reviewed. Design flow estimation methodologies including standard design flow and peak flow estimation tools are reviewed along with methods to estimate flow for non-residential systems. Pump sizing, selection, and installation issues are covered. Participants will become familiar with sizing criteria for manifolds for pressure-dosing media filters and learn the basic requirements for pumping to aerobic units. The design of various air delivery devices will be covered as well. Also included are discussions of cost estimation, installation inspection techniques, and creation of as-built drawings.

DESIGN 270: Design and Use of Disinfection Systems

This half-day short course reviews the principles of onsite system design and focuses on design of Disinfection components for onsite systems. Permitting and site requirements are reviewed and regulatory requirements for monitoring and inspection are stressed. Source characterization is addressed with particular attention to requirements for effective Disinfection. Also included are discussions of cost estimation, installation inspection techniques, and creation of as-built drawings.

DESIGN 280: Water Re-Use Systems

This one-day short course reviews the principles of onsite system design and focuses on design of Water reuse systems. Permitting and site requirements are reviewed and regulatory requirements for monitoring and inspection are stressed. Source characterization is also addressed from the standpoint of Reuse systems. Hydraulic and

nutrient loading rates will be covered as well as water storage requirements for reuse systems and the importance of a vegetation management plan. A discussion of possible reuse regimes is followed by a sample design exercise that will be reviewed in the classroom. Also included are discussions of cost estimation, installation inspection techniques, and creation of as-built drawings.

DESIGN 300: Large System Design

This one-day short course reviews the principles of onsite system design and focuses on systems that treat large volumes of wastewater. Design flow estimation methods including standard design flow and peak flow estimation tools are reviewed along with methods to estimate flow for non-residential systems. The importance of groundwater mounding analysis is stressed. Pump sizing, selection, and installation issues are covered in depth. Participants will become familiar with sizing criteria for manifolds for pressure-dosed conventional systems as well as alternative drain fields such as LPP and learn to specify the proper pump for a given design. Also included are discussions of cost estimation, installation inspection techniques, and creation of as-built drawings.

DESIGN 301: Design Collaborative Workshop

The workshop will be conducted as a design collaborative, in which realistic situations (four problem scenarios) will be assessed, and systems will be designed, reviewed for regulatory compliance, and hypothetically constructed. Participants will work on several problem scenarios including 1) a church expansion, 2) an undeveloped tract proposed for a shopping center, 3) an elementary school expansion, and 4) a system repair at a country club. Participants will use background information to 1) assess the solution options, 2) select a course of action, 3) design a solution, 4) respond to regulatory review comments, and 5) hypothetically implement a plan through an open dialogue on facility construction and final certification. Participants will use a small group setting to develop solutions to their own case study problems.

DESIGN 310: Applied Hydraulics

This three-day workshop presents concepts that are required for full understanding of hydraulic principles common to decentralized wastewater treatment.

Alternative Treatment Systems

The Alternative Treatment Systems (ATS) series of courses begins with an introductory overview of onsite wastewater technologies. The ATS 200 series focuses on specific technologies now available, including those considered more complex or not widely utilized in Kentucky.

ATS 100/101: Onsite Wastewater Technology Overview

This course provides general information on the complete range of onsite wastewater technologies, from the most basic to the most complex. The entire wastewater treatment and dispersal system consists of different components defined by the different functions they have. The course includes information needed to select the appropriate set of

components to make up the wastewater system for any given site. Presentations will focus in varying levels of detail on the technologies grouped by the type of component. This course primarily relates to technologies used for individual and cluster systems. Many of the technologies presented are common in systems with larger flows also, but larger flows are outside the purview of this course. The course contains materials for a one or two-day program.

ATS 200: Wetland Treatment Systems
This course will focus on the basic concepts, operation, and maintenance of wetland treatment systems.

ATS 201: Sandfilter Treatment Systems
This course will focus on the basic concepts, operation, and maintenance of sandfilter treatment systems.

ATS 202: Recirculating Gravel Treatment Systems
This course will focus on the basic concepts, operation, and maintenance of recirculating gravel treatment systems.

ATS 203: Fixed Media Treatment Systems
This course will focus on the basic concepts, operation, and maintenance of fixed media treatment systems.

ATS 204: Suspended Growth Treatment Systems
This course will focus on the basic concepts, operation, and maintenance of suspended growth treatment systems.

ATS 205: Alternative Soil Absorption Systems
This course will focus on the basic concepts, operation, and maintenance of alternative soil absorption systems.

Installation and Inspection

Installation and inspection is where the "rubber meets the road" for septic systems. The system design becomes a reality by taking what is planned on paper and transforming it into a reality in the field. Installers must have considerable expertise and experience to be able to correctly interpret, adjust, and adapt the paper design to fit the realities of the building lot. Inspectors must be skilled at identifying and evaluating the key construction elements of the system to ensure that the installation meets the permit conditions and that the system will function properly for the long-term use of the home. The Installation and Inspection short course series focuses upon how the installation-inspection team can improve the construction of decentralized wastewater treatment systems. Installation and inspection of advanced or modified conventional systems, alternative systems, and innovative systems is covered in higher-level short courses.

INSTALL 100: Installation of Gravity Systems

The experienced installer transforms the system design from a paper drawing into a reality. This course will cover the most important points about how to install gravity distribution septic systems. Parallel and serial distribution systems are covered as are installation of the basic system components including tanks, appurtenances, distribution devices and drainfield components. Gravity distribution into many of the newer gravelless trench technologies is also covered.

INSTALL 101: Installation Field Practicum

Participants will learn how to layout a system in the field and how to deal with layouts at difficult sites. The class will visit a site with an actual installation ongoing. This will either be a site where a system is being installed, was recently installed or at a training location. At the training location, attendees will participate in the installation of a tank and of a short trench segment using various alternative trench media.

INSTALL 110: Construction Inspection BMPs for Onsite Systems

This short course presents best management practices (BMPs) for installation and for inspection of onsite system construction. Best management practices go beyond the minimum requirements in the rules and provide approaches for ensuring the best possible onsite treatment system. The course provides the installer and inspector with a set of installation BMPs and construction inspection BMPs as well as inspection diagrams and check-off sheets for installation and inspection. The course concludes with an inspector panel including local health agency representatives who address important local installation issues and needs for installers who work in their jurisdictions.

INSTALL 200 series

This series of short courses cover installation and inspection of proprietary and non-proprietary tanks, trench modifications, pretreatment systems, and distribution devices/drainfield options. Product representatives from technology manufacturers help teach the courses dealing with proprietary technologies to assure that the installers and inspectors get the correct detailed information concerning special installation needs of their technologies. This series will include multiple courses, including:

INSTALL 201/202: Installation Techniques for Gravelless Trench Technologies

INSTALL 203/204: Installation Techniques for Fixed Media Technology

INSTALL 205: Installation Techniques for Wetland System Technology

INSTALL 206/207: Installation Techniques for Suspended Growth Technology

INSTALL 208: Installation Techniques for Mound System Technology

INSTALL 300: Installation & Inspection of Large Onsite and Communal Systems

Large decentralized systems provide unique opportunities and substantial demands on the expertise of installers. Staging and timing of installation become less flexible because of the more extensive coordination necessary to achieve a cost effective and efficient installation. The decentralized wastewater team is more substantially involved in reviewing the installation and assuring its completeness. This short course will focus on what an installer needs-to-know for installation of large onsite systems for commercial uses, large design flows such as schools as well as installation dynamics for cluster systems that utilize communal pretreatment or drainfields.

Operation, Monitoring and Maintenance

Once the system is installed, operation and maintenance (O&M) are the key elements to assure long-term performance. Research has shown that 40-50% of advanced types of onsite systems can malfunction without O&M by trained operators. These O&M short courses are designed to provide the professional training to develop and enhance the skills of service providers who inspect, monitor, operate, and maintain alternative and/or large-scale onsite systems. The training series starts with the three-day Subsurface Wastewater System Operator Training School that provides a comprehensive overview. Then, the other short courses in the 100 and 200 series provide continuing education opportunities for operators to update their skills, stay current with new requirements and gain more advanced expertise.

O&M 100: Subsurface Wastewater System Operator Training school

Proper operation and maintenance are important to assuring the longevity of onsite systems. This training school will help participants learn how to provide quality service to owners of advanced onsite systems. Three full days of information and hands-on training will prepare participants to take the state certification exam

O&M 101: Subsurface System Operator Refresher Course: LPP Systems

Operators of Low Pressure Pipe systems are often faced with many technical problems, while servicing their customers day-to-day. This one-day course is designed to update skills in managing LPP systems and help correct problems more quickly. This course uses in-field hands-on training to develop operators' skills in conducting thorough inspections and troubleshooting LPP systems. Inspection visit protocols are covered as well as four problem scenarios in the field. Participants also use a small group setting to tap into the experience of the other operators in the course in solving their own local problem scenarios.

O&M 102: Subsurface System Operator Refresher: Fixed Media

The number one challenge with fixed media filters is optimizing their operation to meet the most stringent effluent limitations. Students will learn how to maintain media filters at peak efficiency.

O&M 103: Subsurface System Operator Refresher: Drip Irrigation Systems

Drip irrigation systems are highly advanced wastewater distribution technologies, but "high tech" has its own unique operational challenges. Participants will increase their knowledge and confidence with both large community systems and smaller residential ones.

O&M 104: Pretreatment System O&M

This class covers the inspection, monitoring, operation, and maintenance needs for a broad range of advanced pretreatment systems ranging from individual residential system size to large communal pretreatment systems serving moderately sized, commercial establishments, and housing complexes. The technologies discussed include peat biofilters, foam biofilters, textile biofilters, home and small commercial aerobic treatment units including suspended media and fixed film systems, nutrient reduction technologies, wastewater strength reduction technologies, and disinfection technologies.

O&M 105: Sampling Smartly

Sampling is an important component of many advanced treatment technologies and environmental water quality monitoring programs and can be difficult to accomplish. This short course covers important sampling issues such as the reasons for sampling, proper methods for collecting and handling samples, hold-times for different analyses, laboratory methods, chain of custody protocols and sampling for environmental forensic cases, legal implications, interpretations of sample results, re-sampling issues for remediation of bad samples and special groundwater sampling issues.

O&M 106: Subsurface System Operator Refresher Course: Suspended Media

O&M 107: Basic First-Aid & Bloodborne Pathogens

O&M 108: Buried Utilities & Trench Safety

O&M 109: Confined Space & Trench Safety

O&M 110: Equipment Operation & Safety

O&M 200: Inspection, monitoring and O&M field practicum

This one-day short course focuses upon a field inspection and monitoring visit to advanced onsite technologies. Inspection processes, monitoring methods, measurement processes, operation and maintenance activities, and safety issues are addressed in a field setting at real functioning systems of various designs. Operator reporting forms for various technologies are covered as well as the most efficient ways to conduct inspections that gather the correct data.

O&M 201: Septic Tank Pumping, Cleaning laterals and other lines

LPP systems frequently have solids accumulate within the laterals and manifold. Oftentimes these solids can be "blown out" during normal O&M visits by directing all of the pressure within the pipe network to one lateral at a time. This one-half

day short course covers proper methods to safely clean laterals during routine maintenance, but also addresses the more difficult situations where routine line cleaning does not work effectively. For these situations, pressure washing laterals with or without artificial air-assists can be effective and will be demonstrated. Other cleaning methods such as brush "push/pull" cleaning, orifice displacement and efficient methods for replacement of entire lateral pipes in the field will be demonstrated to accomplish removal of accumulated solids, anaerobic slimes that grow in pipes and root intrusions that block orifices.

O&M 203: Large system O&M

Large onsite systems present some of the most difficult challenges for O&M and frequently have the poorest performance record of all decentralized systems in the absence of professional O&M. Special issues that occur when conducting inspections and O&M of larger onsite systems relate to difficulties in measuring pump delivery rate, checking pressure heads, determining pump runtimes and dosing sequencing to sub-fields, assessing flow equalization, evaluating control system operation, confirming operation of solenoids and motor-actuated valves and identifying un-permitted flow additions. This short course relates typical operational problems unique to large systems and covers inspection methods to address these issues and O&M approaches to remedy them.

O&M 204: Composting Operations

This course provides general information on the complete range of composting technologies, from the most basic to the most complex. The composting process consists of different technologies and components defined by process. The course includes information needed to select the appropriate set of components to make up the composting system for any given site. Presentations will focus, in varying levels of detail, on the technologies as grouped by the type of component. This course primarily relates to technologies used for treatment of wastewater sludge, pumping from septic tank and other biological wastewater treatment systems. The proven technologies presented are in use across the United States and North America.

O&M 205: Land Application Operations

This course provides general information on the complete range of land application technologies, from the most basic to the most complex. The land application process consists of different technologies and components defined by process. The course includes information needed to select the appropriate set of components to make up the land application system for any given site. Presentations will focus, in varying levels of detail, on the technologies as grouped by the type of component. This course primarily relates to technologies used for treatment of wastewater sludge, pumping from septic tank and other biological wastewater treatment systems. The proven technologies presented are in use across the United States and North America.

O&M 206: Biosolids Processing: Advanced Composting Techniques

O&M 207: Biosolids Techniques: Advanced Land Application Techniques

Troubleshooting and Repair

Repair of failing systems is one of the most challenging tasks facing onsite wastewater specialists whether they are environmental health specialists in the local health department or private contractors such as system designers, installers, and operators. As onsite systems become viewed as a permanent solution to the wastewater management infrastructure in communities (that is, the sewer is never coming), then it quickly becomes apparent that onsite system repair becomes a high local priority, since sewering the area will not be a solution available to the community. Hence, repair of onsite systems then becomes a regular, expected part of the on-going wastewater management program in the community.

REPAIR 100: Principles of Troubleshooting: Small Systems

A system repair strategy is oftentimes determined without a thorough understanding of the causes of system failure. This course teaches students to make system repair a two-pronged process that begins with assessing the cause of the failure and then designing a repair solution that fits the causes. Students will learn about 10 critical steps to troubleshooting and repair of small onsite systems, including how to use FACTSS (Failure Analysis Flow Chart for Troubleshooting Septic Systems) when troubleshooting poorly performing systems. FACTSS identifies the most likely causes of system failure as "red flags" based upon input data provided by the evaluator.

REPAIR 101: Troubleshooting: Case Studies for Small Systems

This two-day short course follows on what was learned about the FACTSS process in REPAIR 100 and brings real-life case study examples into the classroom through video and soil samples. Repair solutions are provided for each of the red flags identified using the FACTSS flow chart. Other repair options including "silver bullets" and non-soil options for unsolvable situations are discussed. Students discuss the concept of BPJ, or "best professional judgment" and discuss when, where and how to appropriately implement BPJ. Participants then work in a small group setting as case study scenarios are presented to students. Each group determines the most likely causes of system failure for the case studies and then suggests appropriate solutions back to the entire class for dissection of their analysis and discussion of other options for remedying the problem.

REPAIR 140: Control System Troubleshooting

Pumps and controls are at the heart of all low-pressure pipe and many advanced treatment systems. Participants will get an in-depth look at types of pumps; pump sizing, types of controls and panels, installation and troubleshooting.

REPAIR 150: Principles of Troubleshooting: Large Systems

REPAIR 200: Advanced Troubleshooting: Small Systems

REPAIR 210: Advanced Troubleshooting: Large Systems

Business Management

This series of courses focuses on practitioners such as installers and operation and maintenance providers, whether sole proprietors or owners, or employees of multi-employee onsite services companies. This series is designed to help the practitioner understand their role in the onsite wastewater industry, as well as how to assist their onsite business in becoming sustainable in the long-term.

BUSINESS 100: Operator Responsibilities, Ethics, and Duties

BUSINESS 101: Business Planning for Installers

This short course will introduce participants to the characteristics of successful businesses and address how to determine fees for your business. Legal issues to consider in starting and improving a business are covered including insurance options, environmental laws and regulations, wage and labor issues, timely collection of payment, business and employment taxes, use of contracts and disaster preparation. Participants will also learn how to develop brief business plans and enhance their marketing skills. The basic types of business organizations are addressed with guidance on selecting the correct organization.

BUSINESS 102: Cost Estimation Methods for System Installation

Installation cost estimation is a rarely taught skill, but instead is generally learned via on-the-job training. This short course will cover the primary parts of job estimating for installers including input design parameters that influence construction costs (such as design flow, pretreatment requirements, distribution loading rates, distribution line lengths and additional system requirements), timing requirements for construction sequencing, influence of technology acceptance by the regulatory community as well as practical methods to estimate basic input costs including labor costs, heavy equipment costs, material costs, interest rates, inflation rates, computation of real interest rates, length of loan payoffs, installer's margin on labor and equipment and administrative costs.

Business 150: Time-Of-Sale Inspections: Basics of Monitoring

This one and a half-day short course covers the methods and approaches for making time-of-sale inspections of onsite systems prior to homes changing ownership. The types of inspections and roles and responsibilities of inspectors are addressed. Safety issues and precautions are presented in substantial detail, as are the tools and equipment needed in the inspection trade. Participants will review technologies at a training center in light of identifying common problems or red flags for each technology type that would indicate less than adequate performance. Participants will conduct two mock time-of-sale septic system inspections at existing homes using a standardized inspection form. Participants will take a written exam and conduct a field practicum exam.

Business 151: Time-of-sale inspections: Alternative and innovative systems

This course follows the earlier time-of-sale inspection course by covering inspection issues for alternative and innovative technologies in more detail. Topics covered include making sense of timers, controls event counters and meters, float types and function, pumps (types and applications), electrical control panel and junction boxes, pump vault and lateral cleaning issues, O&M nuances of selected systems, troubleshooting and detecting problems as well as safety issues.

BUSINESS 205: Business Issues for Operators and Service Professionals

Note: As discussed earlier, the majority of course descriptions above have been adapted from CIDWT's Model Decentralized Wastewater Practitioner Curriculum. Where the original document has been tailored to Kentucky by KOWA, the course description is based on the actual finished document. Courses for which no description is provided have been suggested as additional courses for Kentucky, thus course descriptions have not been yet been prepared for the model program.

TECHNOLOGY DEMONSTRATIONS

Technology Demonstrations

KOWA recognizes that the industry is limited in the use of new treatment systems on problem sites because there is no systematic means to introduce these advanced treatment systems to onsite practitioners. This was the initial premise on which EPA grant funding was secured as seed money to begin construction of the Kentucky Onsite Training Center located at the Lawrenceburg Campus of the Bluegrass Community & Technical College. Under its 319(h) grant, KOWA completed installation of additional technology demonstrations as a component of the development project. These systems will provide target audiences with sound information on available technology, allowing them to select the appropriate BMP (Best Management Practice) for a given site, as well as properly install and maintain the system. Technology demonstrations will include existing and proven BMPs from other areas of the U.S. suitable to Kentucky uses for onsite wastewater control. Originally, program developers considered the integration of three additional regional sites in Kentucky. It did not prove feasible to acquire, develop, operate, and maintain additional sites due to staffing needs, utilities and maintenance costs, and security issues

A site map, including existing demonstrations, has also been completed as a planning tool for program developers.

Technology demonstrations were initiated under KOWA's first designated EPA grant. The majority of technology installations occurred under a subsequent 319(h) grant. While the grants provided funds for various aspects of the project, demonstration systems and components were contributed by onsite industry manufacturers and distributors, thus providing the major source of in-kind match for the project.

Major Technology Demonstrations completed through September 2007:
Puraflo® Peat Filter
Ecoflo® Peat Biofilter
Zoeller Z-cell Up-Flow Wetland
Zoeller Recirculating Gravel Filter
Zabel Aerocell Advanced Treatment System
Gribbins Whirlair Aeration Unit
SJE Pump/Alarm/Switch Display
Infiltrator Chambers Display
1000 gal. AK Septic Tank
Gag Simtech Pressure Filtering System
Lagoon Demonstration System
Zabel SCAT Unit (replaced w/ new model - SCAT 200 Advanced Treatment Module
Eljen Xpandable Chamber & In-drain Display
Bio-Microbics FAST® Wastewater Treatment System

Zoeller Fusion Cell ZF 450 Treatment System
Netafim Drip Irrigation Treatment System
Geoflow Drip Irrigation Treatment System
Chromoglass Batch Reactor A-5 SBR
500 gal. Rochester Pump Tank
1000 gal Premier Tech Septic Tank
1500 gal. Norwesco 2-compartment Septic Tank
1500 gal. Fralo 2-compartment Septic Tank
Simplex Grinder Display
Automatic Siphon Display
Conventional Trench Display
Gravelless Pipe Display
Incinolet Electric Incinerating Toilet
Excel Self-Contained Composting Toilet
Eloo System
Note: Current demonstrations include those accomplished through an EPA seed grant (1999-2002) and through 319(h) grant funds (2002-2007).

Numerous additional components and supplies have also been contributed and can be incorporated in future demonstrations and training sessions. These include items such as pumps, alarms, controls, risers, lids, septic tank locator, etc.

Demonstrations planned for the future include:

E-Z Flow Soil Absorption System
Hoot Aerobic System
Concrete Septic Tank Troubleshooting Display
Mound System
Conventional System & Troubleshooting Demonstrations
Conventional Constructed Wetland

Current and potential utilization of technology demonstration site:

<u>Practitioner Education</u>

- *Initial Installation of Technology Demonstration*
  When feasible (i.e. based on the contributor's schedule and other logistics), the initial installation of BMP can be conducted as a class or field day. The installation will include information about the cost, pollution control efficiency, installation requirements, and maintenance requirements. The manufacturer or its authorized distributor/installer should conduct the training.

- *Instructor-led Tours*
  Tours of the demonstration systems can be incorporated into all training sessions or courses held by KOWA at the Bluegrass Community & Technical College. Instructors may choose to highlight specific demonstrations based on course content,

or may elect a general overview of all systems. Special tours or field days should be periodically or routinely scheduled and promoted by KOWA. Special tours can also be arranged on request to accommodate specific groups of practitioners.

- *Self-guided Tours*
  The demonstration site is available to practitioners at all times. To facilitate self-guided tours, literature boxes should be a part of each demonstration. At the training center entrance or other visible starting point, a site map or demonstration listing may also be needed to provide additional guidance or overall center information to visitors.

Public and Private Sector Education

- *Instructor-led Tours*
  Tours of the demonstration systems can be incorporated into all training sessions or courses held by KOWA at the Bluegrass Community & Technical College. Instructors may choose to highlight specific demonstrations based on course content, or may elect a general overview of all systems. Special tours or field days should be periodically or routinely scheduled and promoted by KOWA. Special tours can also be arranged on request to accommodate specific groups representing public and private sectors.

- *Self-guided Tours*
  The demonstration site is available to public and private sector visitors at all times. To facilitate self-guided tours, literature boxes should be a part of each demonstration. At the training center entrance or other visible starting point, a site map or demonstration listing may also be needed to provide additional guidance or overall center information to visitors.

Website Integration

- KOWA's website should be updated to provide improved information on the overall training center (location, directions, requesting tours, self-guided tour, etc.).
- The website should be updated to provide a virtual tour or version thereof, including additional photos, technology information, and manufacturer contact for each demonstration installed at the site.

OUTREACH & MARKETING PLAN

Outreach and Marketing Plan

The Kentucky Wastewater Education Program encompasses an integrated system of onsite wastewater education and outreach, one that reaches *all* parties essential to solving wastewater disposal issues for Kentucky. While this long-term vision for the program is both comprehensive and challenging, effective communication is integral to its accomplishment. An effective communication system must reach all appropriate audiences as well as convey a message that is applicable to the different audiences.

In drafting this written or formal "plan," the following elements have been considered thus far and will need additional thought and discussion as the program evolves:

- *Target Audience*
  In earlier sections of this draft manual, three primary target audiences are identified and described. They include practitioners, the public sector, and the private sector. (See pages 7 and 19.)

- *Message*
  The program's underlying message is that education and outreach about onsite wastewater disposal will assist in improving degraded water quality resulting from non-existent, inadequate, and failing onsite systems, as well as the future protection of limited surface and groundwater resources from this form of NPS pollution. While this message is certainly at the heart of the program, it is a difficult one to relay to most target audiences as they seek information for a variety of reasons. Therefore, programs, services, and materials geared to individual audiences must be based on a message that has personal application, but has the result of conveying the central message of the program. Additional information about the message needs of the target audience is also described on the pages noted above.

- *Benefits*
  For the message to be of value to the target audience, some type of personal benefit must occur. Again, this will differ between the various audiences.

- *Product*
  Ultimately, the program is packaging (marketing) several products for distribution to customers (audiences), so it is important to keep in mind what those products are and how each might need to be marketed differently. "Products" of this program include independent or CEU training courses, practitioner certification programs, technology demonstrations, public awareness programs, and public outreach materials.

- *Information Needs and Delivery Tools/Methods*
  These elements look at specific types of information or items needed by the target audience and the options for delivering or providing that information or item to the audience.

- *Initiatives*
  Each component of the plan requires the accomplishment of a number of priorities or steps that must occur in order for outreach and marketing to be developed and implemented successfully. In most cases, these initiatives are also critical to the very existence and progress of the Kentucky Wastewater Education Program as it is envisioned for the future.

Practitioner Education Initiatives:

1. Create working partnerships between industry leadership and the state's onsite regulatory agencies to determine and establish an appropriate education infrastructure. (The success of a statewide education program requires the involvement, cooperation, and resources of all parties and leadership. This draft manual represents a guide for facilitating future discussions. Educational infrastructure includes agreement on a long-range vision, implementation, and sustainability.)
2. Develop an integrated and user-friendly database of all onsite practitioners in Kentucky. (To-date, rudimentary databases have been established for system installers, pumpers, manufacturing/sales, septic tank producers, and regulators as a starting point for this initiative. Additional practitioner groups must be identified and included in the communication system. The initial databases must be merged into a single platform, with user-friendly features that meet program administration needs.)
3. Obtain or complete curriculum and outreach materials. (Based on the adoption of a statewide practitioner education program, additional curriculum and materials must be obtained and/or completed.)
4. Integrate technology into education infrastructure. (Educational resources include the Kentucky Onsite Wastewater Training Center's technology demonstrations and exhibits. The Training Center will be an important component in wastewater education and must be incorporated in ways that further program goals.)

Public and Private Sector Education Initiatives:

1. Develop an integrated and user-friendly database of public and private sectors in Kentucky. Alternatively, develop partnerships with groups or organizations with such databases. (This will provide direct access to the target audiences for public outreach purposes. Resources include government listings, licensing entities, and professional organizations such as Kentucky Homebuilders Association or Kentucky Banking Association.)
2. Obtain or complete curriculum and outreach materials. (Continue the development of public outreach programs and materials as identified in the curriculum plan.)
3. Integrate technology into education infrastructure. (Educational resources include the Kentucky Onsite Wastewater Training Center's technology demonstrations and exhibits. The Training Center can be incorporated in ways that further program goals.)
4. Develop a sustainability plan for long-term marketing and outreach to public and private sectors.

AUDIENCE	**PRACTITIONERS**
Product(s)	Training Courses Certification Program Technology Demonstrations
Message	Adherence to standard knowledge/skill set focused on design, installation, operation and management, and technical requirements.
Personal Benefits	Business Profitability/Sustainability
Information Needs:	**Delivery Tools/Methods:**
Training/certification overview/description	*Direct Mail, E-mail Listserve, Website (*Program Brochure, Press Release/Flyer, Newsletter, Fact Sheet) *Partnership Networking* (material distribution through state/local agencies, high schools, technical schools, etc. w/ access to audience)
Training/Class Opportunities Technology/Demonstration Opportunities	*Direct Mail, E-mail Listserve, Website* (Class/training notifications, schedules, course catalog) *Partnership Networking* (material distribution through state/local agencies, high schools, technical schools, etc. w/ access to audience)
Registration Accessibility	*Direct Mail, E-mail Listserve, Website* (mail-in registration, on-line registration)
Certification Verification/Progress Review	*Direct Mail, Personal Contact* (individual verification/report) *Website* (interactive user account)
Industry Information (industry news, product information, technical information, etc.)	*Direct Mail, E-mail Listserve, Website* (press release/flyer, newsletters, fact sheets, product approvals, partner links)
Public information materials (for personal use or for customers)	*Direct distribution* through training sessions, conferences, program partners, etc. *Website* (pdf files for download/print)

AUDIENCE	**PUBLIC SECTOR**
Product(s)	CEU or Public Outreach Programs Public Outreach Materials Technology Demonstrations
Message Link	Local/community impacts of onsite wastewater disposal; appropriate technology for community planning
Personal Benefits	Sustainable community development; local impacts in terms of economics and public health.
Information Needs:	**Delivery Tools/Methods:**
Training/Class/Seminar Opportunities (possibly meeting CEU requirements) Technology/Demonstration Opportunities	*Direct Mail,E-mail Listserve, Website* (Press Releases containing program notifications/schedules,) *Partnership Networking* (cooperate w/ local, governmental or professional organizations to sponsor/promote scheduled programs; website partner links)
Registration Accessibility	*Direct Mail,E-mail Listserve, Website* (mail-in registration, on-line registration)
CEU Verification	*Direct Mail, Personal Contact* (individual verification/report) *Website* (interactive user account)
Public Outreach Materials	*Direct distribution* through scheduled programs, partner events, local/state agencies. *Website* (pdf files for download/print) (public outreach videos/clips)

AUDIENCE	**PRIVATE SECTOR – REAL ESTATE & BANKING**
Product(s)	CEU or Public Outreach Programs Public Outreach Materials Technology Demonstrations
Message Link	Local/community impacts of onsite wastewater disposal; appropriate technology for community planning; value of proper treatment and disposal in terms of economics and public health.
Personal Benefits	Personal economics and quality of life.
Information Needs:	**Delivery Tools/Methods:**
Training/Class/Seminar Opportunities (possibly meeting CEU requirements) Technology/Demonstration Opportunities	*Direct Mail,E-mail Listserve, Website* (Press Releases containing program notifications/schedules,) *Partnership Networking* (cooperate w/ local, governmental or professional organizations to sponsor/promote scheduled programs; website partner links)
Registration Accessibility	*Direct Mail,E-mail Listserve, Website* (mail-in registration, on-line registration)
CEU Verification	*Direct Mail, Personal Contact* (individual verification/report) *Website* (interactive user account)
Public Outreach Materials	*Direct distribution* through scheduled programs, partner events, local/state agencies. *Website* (pdf files for download/print) (public outreach videos/clips)

AUDIENCE	**PRIVATE SECTOR - HOMEOWNERS**
Product(s)	Public Outreach Programs Public Outreach Materials Technology Demonstrations
Message Link	Value of proper treatment and disposal; homeowner responsibilities.
Personal Benefits	Personal economics and quality of life.
Information Needs:	**Delivery Tools/Methods:**
Public Outreach Program Opportunities Technology/Demonstration Opportunities	*Website, Local Media* (Press Releases containing program notifications/schedules,) *Partnership Networking* (cooperate w/ local, governmental or civic organizations such as local Health Departments, libraries, Cooperative Extension or Community Education to sponsor/promote scheduled programs; website partner links)
Registration Accessibility	*Local Media, Partnership Networking, Website* (mail-in registration, on-line registration)
Public Outreach Materials	*Direct distribution* through scheduled programs, partner events, local/state agencies, and organizations. *Website* (pdf files for download/print) (public outreach videos/clips)

PROGRAM EVALUATION PLAN

Program Evaluation Plan

Evaluation is a necessary function for determining the success or effectiveness of the program. Whether the program meets industry needs and increases public awareness are important questions in continuously improving the quality of the program. Evaluation will assist in identifying long-term needs, as well as determine the strategies necessary for future sustainability. The following table outlines the three primary areas of focus for program evaluation:

Evaluation Focus Area	**Monitoring & Assessment Tools**	**Data Indicators;**
Quality/effectiveness of Practitioner Education Programs	1. Increase in number of programs conducted annually. 2. Increase in annual attendance. 3. Repeat attendance by participants. 4. Random participant class evaluations. 5. Follow-up surveys of participants completing certification programs. 6. Surveys of local health departments to measure impacts on onsite wastewater programs. (i.e. installer competency, decrease in failing systems, etc.)	1. Need/demand for programs. 2. Need/demand for programs. 3. Preference for programs over other providers. 4. Quality/effectiveness of individual sessions. 5. Quality/effectiveness of certification programs. 6. Quality/effectiveness of education programs on state's onsite wastewater programs.
Quality/effectiveness of Public and Private Sector Outreach Programs	1. Number of programs conducted annually. 2. Annual attendance. 3. Number of publications distributed. 4. Geographic distribution of publications.	1. Ability to reach specific target audiences. 2. Extent of public outreach. 3. Extent of public outreach. 4. Extent of public outreach.
Development and Growth of Technology Demonstration Site	1. Increase in number of technologies demonstrated. 2. Annual attendance for conducted tours (by various audience sectors).	1. Industry support. 2. Need/demand for technology education component; extent of public outreach.

Planning for Sustainability

The Kentucky Wastewater Education Program was initiated through a combination of grant and matching funds. With the closing of the grant-funded program in 2007, program sustainability becomes an issue. The sustainability of the overall program must be supported by successfully sustaining the three primary components of the program: 1) Practitioner Education, 2) Public and Private Sector Outreach, and 3) Technology Demonstrations. The following represents a preliminary draft for discussion purposes:

Program Component	**Related Costs**	**Potential Resources (# corresponds to related cost #)**	
Practitioner Education	1. Curriculum/Course Development 2. Logistical – Classroom, Equipment, Manuals/Supplies 3. Instructor(s) 4. Program Administration	1. Adaptation from other sources; partnerships; volunteers; outsourcing 2. Partnerships; KOWA or program funds (cost-based fees) 3. Partnerships; KOWA or program funds (cost-based fees) 4. KOWA or program funds (cost-based fees); Sponsorships	
Public and Private Sector Outreach	1. Curriculum/Course Development 2. Logistical – Classroom, Equipment, 3. Public Outreach Materials (development, printing, distribution) 4. Instructor(s) 5. Program Administration	1. Adaptation from other sources; partnerships; volunteers; outsourcing; additional grants 2. Partnerships; KOWA or program funds (cost-based fees); sponsorships or advertising 3. Partnerships; KOWA or program funds (cost-based fees); additional grants 4. KOWA or program funds (cost-based fees) 5. KOWA or program funds (cost-based fees); sponsorships	
Technology Demonstrations	1. Utilities and Maintenance 2. New Demo Installations 3. Tour Guide 4. Administrative (soliciting new demos; general oversight)	1. Manufacturer/Contributor Annual Fee or Sponsorship 2. Manufacturer/Contributor 3. KOWA or program funds 4. KOWA or program funds	

APPENDIX D – SUPPLEMENTAL DOCUMENTS

MATERIALS ARE CONTAINED IN THE HARD COPY SUBMISSIONS ONLY.

APPENDIX A
FINANCIAL & ADMINISTRATIVE CLOSEOUT

APPENDIX B
BMP IMPLEMENTATION PLAN

APPENDIX C
KENTUCKY WASTEWATER EDUCATION PROGRAM MANUAL

APPENDIX D
SUPPLEMENTAL DOCUMENTS