Epidemiological relationships between disease incidence and well/septic system proximity

Floyd Frost,
Aurora Health Care

A study done at the time of the Milwaukee outbreak found that person-to-person transmission of Cryptosporidium (that resulted in illness - i.e. cryptosporidiosis) was extremely uncommon. In our serological surveys, the source of the drinking water (surface-filtered versus ground water) was consistently a strong predictor of the prevalence of serological responses. People on surface sources were more likely to have a serong serological response to Cryptosporidium antigens. This leads us to believe that serological response - a marker of recent infection - is strongly related to water source. In fact, low-dose water contamination by Cryptosporidium is likely to immunize us from this parasite. In a paper coming out soon we found that by cleaning up already clean water, the diarrheal illness rate went up, likely because of reduced immunization from low-dose drinking water exposures

Unfortunately, when humans get into the act of water contamination, unlike exposure to exposure to non-human animal poop, exposure to human poop pass along a number of other bugs that can cause human illness, some of which can be really nasty. For purposes of groundwater contamination, serological responses to Cryptosporidium antigens offer a marker of ground water contamination. In moderately advanced countries such as the United States, this marker seems to work well.

BRIEF BIOGRAPHY

Dr. Floyd Frost is a research scientist at Aurora Health Care in Milwaukee, Wisconsin. He is an international expert on the epidemiology of infectious waterborne diseases and has directed many large population-based epidemiologic studies of the relationship between drinking water and health effects both in the United States and other countries. Dr. Frost previously served as the director of the chronic disease epidemiology program in the Washington State Department of Health and recently retired as senior research scientist with the Lovelace Respiratory Research Institute in Albuquerque, New Mexico.

Onsite Wastewater Treatment Before and After Today

E. Jerry Tyler
Tyler and Associates Inc.

Twenty five years before today, 1984, was just yesterday. Twenty five years after today, 2034, is just tomorrow. The technology, regulations and entrepreneurial nature for onsite wastewater treatment changed in the past 25 years and will change in the next 25. Many changes may have been for the good of the user public. However, many changes were based on little data, considerable politics and almost no participation by the user public. Some of the changes were possibly made based on false fears. The trends set by the past will likely continue into the future.

Actually, 25 years ago is not long enough ago to get a reasonable perspective on the history of where we are today. Going back to the turn of the last century and considering that about that time wastewater infiltration to soil was used as running water became available to rural homes. Rural citizens wanted conveniences like those of the urban population. In the early 1900s there were designs and construction criteria available for the so called septic system. Users in rural America at that time were experienced using land and soil to meet their needs, knew why they wanted the systems and probably did their own installation. Much of what these treatment system pioneers did for their families is now mandated by regulation and not understood by the families they serve.

After World War II the growth of suburban housing increased faster than the construction of public sewers. A proliferation of septic system use for treatment of domestic wastewater occurred assuming the systems were temporary until sewer construction could be extended into the new suburbs. The proportion of users familiar with the systems serving them decreased. The systems in some areas were successfully treating wastewater from large numbers of homes while in other regions the systems had problems. Some homes on Long Island, New York, for example, had suds in the water supply from wells tapping ground water receiving detergents from the high density of septic systems. More than twenty years after World War II, during the late 1960's, sewer construction to replace septic systems on the Island was still in progress. It was not until the 1990s that the US Environmental Protection Agency decided that onsite wastewater treatment systems could be a permanent method of sewage treatment.

In areas where septic systems have never been successful, regulations were adopted for discharge of wastewater to the ground surface or to surface waters after using certain technologies. In some areas regulations were not enforced so that citizens could continue to live in the area. In most parts of the country at least some portion of regulation is written with little technical basis that insures citizens could live there. The process of writing regulations based on assuring issuance of sanitary permits rather than health and environmental goals probably continues though is unlikely documented.

BRIEF BIOGRAPHY

Dr. Jerry Tyler is President of Tyler and Associates, Inc. and Emeritus Professor of Soil Science, University of Wisconsin-Madison. For over thirty years, Jerry conducted research on the acceptance and treatment of onsite wastewater by soil and provided training in Wisconsin on soil and site evaluation and design selection for wastewater treatment systems. Besides

working on the Wisconsin Mound and At-Grade Manuals he developed tables of basal and linear loading rates based on soil morphological characteristics. In addition to soils consulting, Jerry is now developing design separation distances based on soil morphology, wastewater design loading rates and wastewater qualities. Jerry also continues to provide training about the use of soil for wastewater treatment in the classroom, field, and with his traveling soil laboratory.

Water, Wastewater and Reuse: Accomplishments and Challenges

Charles P. Gerba
University of Arizona

It is almost 100 years since drinking water and wastewater treatment began to be practiced in the United States. This ended the age of widespread outbreaks of water associated human disease and had the most significant impact of any single advance in history designed to improve human health. The continued discovery of new waterborne pathogens, new molecular methods for detection of pathogens and our ability to track them in the water environment continues to present new challenges in both treatment and our understanding of the role of water in human disease. One pathogen capable of being transmitted by water has been discovered every year for the past twenty years. Source tracking of pathogens in water has revealed the importance of pathogens growing in distribution systems after treatment. We have to be aware that as we develop new treatment technologies to improve water quality we may be creating new opportunities for microorganisms to penetrate water supplies, contaminate surface and ground water or grow in water supplies. Water reuse presents its own challenges in terms of reliability in pathogen removal by treatment processes and the need for near real time monitoring and assessment. This may best be accomplished by combinations of man-made treatment processes and natural systems. Better management of natural systems for treatment objectives would greater aid this combination of technologies, especially for on-site and regional water reuse applications. Waterborne pathogenic microorganisms will always be a threat to safe water, and technology must continue to advance to keep pace with our understanding of waterborne disease microorganisms.

BRIEF BIOGRAPHY

Charles Gerba is a Professor of Environmental Microbiology at the University of Arizona. He has published over 500 articles and several books on environmental microbiology and pollution science. His research focuses on safety of wastewater, biosolids and graywater reuse, and microbial risk assessment.

The Birth Of On Site Wastewater Management in NC: Twenty Five Years Of On Site Wastewater Program Improvements In NC

Steve J. Steinbeck

The birth of North Carolina's modern on site wastewater management program began in the early 1970's, when two forces came together---the era of 'environmental awakening' and a perception along our coast of accelerating development with septic systems was leading to increased closure of shell fishing waters.

Some coastal communities declared a moratorium on development with septic systems until the NC Legislature acted on a special study that gave rise to North Carolina's Ground Absorption Act of 1973. This legislation and later amendments served as an important foundation for the rules governing the siting, installation, and use of septic systems adopted by the Environmental Management Commission in 1975 and the Public Health Commission in 1977. Until these comprehensive statewide rules were implemented, there were essentially 100 unique local programs. While a very few NC counties, notably Mecklenburg and Wake Counties, were using soil morphology for siting septic systems, most were using percolation "tests" to issue or deny system installation permits.

However, merely ratifying new laws and adopting new rules was just the first step in a long and challenging process of implementing a statewide on site wastewater management program. While NC's laws and rules have been modeled nationally what really set NC's program as the leader of the pack has been the greatly enhanced education and continuing education of the local environmental health professional, and cooperation of our universities, particularly NCSU and UNC-CH.

Research and demonstration projects were an important component of the modern program which had been given short shrift for many years prior to the early 1970's. Some of the important early efforts were the Triangle J Council of Governments Individual Wastewater Project, Septic Effluent Fate and Transport Research, System Performance and Septage Management Studies, and development of the first demonstration system site in Durham Co.

In the 1970's "Life Cycle Management" of on site wastewater system began as a dream and became a reachable goal when the on site wastewater statute was rewritten in 1982. Today NC's onsite wastewater management program continues to be better than the best and but must continue to meet the challenges the 21st century.

BRIEF BIOGRAPHY

Steve Steinbeck retired from NC's on site wastewater program after serving as the only full time employee from 1976-1982. From 1982-2005 served as the program supervisor as the program slowly added regional specialists and engineers. From 1971-1976 Steve was a consultant with Geotechnical Engineering Co. He graduated with a BS in Geology from Campbell University in 1969 and attended graduate school in geology at NCSU in 1970.

Steve resides in Cary but spends much of his time at NC's Crystal Coast (E. I.) with his wife (37 yrs.) Elaine. The birth of grand daughter Logan on June 22, 2008 has substantially altered his outside interests.

1-1 Use of Clustered On-site Wastewater Systems in Western North Carolina

Mark C. Brooks
Brooks Engineering Associates, P.A.

Use of community onsite wastewater systems is growing in Western North Carolina. There are many reasons for this and some of these include:

- Development of higher, steeper terrain;
- Trends in residential subdivision planning;
- "Greener" development trends;
- Smarter infrastructure engineering and planning;
- Advances in system technology and more widespread acceptance of innovative systems.

More elaboration on these reasons is provided below.

One of the most obvious reasons in the trend towards clustered and community septic systems is that recent residential development has begun to put home sites in more and more difficult terrain. The reasons vary. Often the only larger tracts of undeveloped land lie within steeper terrain. People desire homes with spectacular views which require ridge top and steep slope development. These are typically areas with poor soil conditions. Areas of better soils tend to be in "pockets" and are localized. This does not allow for each lot to have its own individual septic system.

Another major factor in the trend towards clustered systems is more sophisticated land planning. Much of recent residential development is targeted towards second and third home buyers, typically close to retirement age. They enjoy their time in the mountains but do not want to care for an acre+ of land. They want a "lock and leave" lifestyle. This lends itself to clustered and multi-family housing. These developments often include a variety of home products including townhomes and condominiums as well as amenities, all of which still have to served by on-site wastewater. As the housing is close together, these types of developments are most practically and cost effectively served by clustered or community systems.

Clustered land plans, such as those described above, also offer many "green" advantages. As the homes are grouped together, there is less impact on the land in terms of grading, clearing, roads, driveways (and consequently less impervious surface). The larger drainfield areas can be in conservation easements and buffer areas.

Historically there has been minimal land planning in the development and subdivision process in rural areas of Western NC. As more upscale communities are planned, more thought is going in to the infrastructure and thus better ways to design sewer collection systems and incorporation of community water systems is seen. More and more cluster/community wastewater systems are planned to allow for increases in density and to provide utility services as opposed to leaving it up to the lot/homebuyer. Less cluster/community wastewater systems are the result of a reaction to something going wrong such as loss of lot sales due to poor soil conditions.

On larger systems, often the cost of engineered systems such as aerobic pretreatment systems and drip dispersal fields is comparative to conventional systems as a result of less intensive labor in the installation and less overall land utilization. More widespread use of has allowed a better understanding of their design and use. Thus engineers, regulatory agencies and other stakeholders are more comfortable with their use. This increased comfort level makes proposing these options in the planning stage less of a hurdle.

Some examples of clustered developments served by clustered and/or community on-wastewater systems will be provided and briefly discussed.

BRIEF BIOGRAPHY

Mr. Mark Brooks, P.E. is a registered Professional Engineer in North and South Carolina. He has a Masters Degree from Montana State University in Civil/Environmental Engineering and Bachelors Degree in Economics from the University of North Carolina at Chapel Hill. He has over 14 years in the engineering design and consulting business. Mr. Brooks works on a wide variety of civil and environmental engineering projects as President and Senior Engineer for Brooks Engineering, P.A., which is a multi-disciplinary engineering firm offering civil engineering, environmental engineering, soil science, surveying, and environmental services.

1-2 The Need For Extra Space Due To Site/Vegetation Issues

Karen Wallace
OSWP

There are many factors that contribute to the suitability of a site for the distribution of effluent wastewater. Topography and vegetation are two factors that are often overlooked when considering the area for which a wastewater system is placed. Land contours can lay uneven and cause drain lines to further separate beyond the minimum horizontal separation distance; thus increasing the total trench length/area required to install the septic wastewater system. Vegetation, especially large trees, cause some drain lines to require blanking, or solid piping, around trees' roots and trunks. The blanking material does not contribute to the required trench length. Thus, additional trench length/area is required to install the septic system. Because of these issues, it is suggested to have 10% or more additional trench length/area before the septic wastewater system is permitted or installed.

BRIEF BIOGRAPHY

Karen Wallace grew up in Jamestown, NC. She attended North Carolina State University and earned a B.S. in Environmental Science with a concentration in Soil Science, and a minor in Botany in 2004. She graduated with her Master of Science in Soil Science in 2007. For a short time she was a private consultant and is currently a Regional Soil Scientist for the Onsite Water Protection Section of NC DENR. She is working with the large system express review program, and is providing expertise to Cleveland, Gaston, Rutherford, Polk, McDowell, Lincoln, Catawba, Caldwell, and Alexander Counties.

Identifying Springs, Seeps, and Intermittent Streams

Danny Smith
NCDENR, SWP

This presentation briefly addresses “what is a: 1) wetland, 2) stream, and 3) riparian zone”. Further, this discussion provides an account of the regulatory foundation/structure from which the regulations originate. The presentation also includes examples/accounts of common violations and concludes with a discussion how to these situations may be avoided.

BRIEF BIOGRAPHY

Danny Smith is the Supervisor of the Raleigh Regional Office with the Division of Water Quality. He has worked with the Division of Water Quality for 16 years and graduated from NCSU with a BS in Fish & Wildlife Science and an MS in Hydrology. Danny has experience regarding compliance related issues associated with both permits and surface water standards as they relate to streams, riparian buffers, wetlands, and wastewater (single family, minor and major wastewater NPDES and spray systems, animal operations and stormwater)

1-4 Saprolite – identification and the rules

Stan Crownover
Buncombe Co. HD

Saprolite is defined as soft, friable isovolumetrically weathered bedrock that retains the original rock's structure and fabric but with a lower bulk density (up to half the original rock's). Saprolite is the parent material of many soils and represents an important part of the soil to bedrock weathering continuum. Saprolites are extensive in the Piedmont and Mountain regions of North Carolina and in the eastern USA. Prior to the 1990's, saprolite was considered unsuitable for wastewater use due to the fact that it was parent material and not soil. Currently saprolite is utilized for wastewater treatment and disposal after careful field evaluation with backhoe pits to determine specific characteristics and variability (vertical and horizontal). The soil evaluation should identify all transitional horizons (B/C, BC, CB) from the B-horizons to the saprolite; this will aid in the design and location of the nitrification trenches. Transitional horizons, often several feet thick, contain both rock controlled and soil structure while the underlying saprolite contain little or no pedogenic structure. Additionally, the transitional horizons often contain illuvial clay that plugs existing soil pores and lowers the conductivity relative to the overlying soil and underlying saprolite. Saprolites typically have a lower clay content, are less sticky and plastic, and often contain geologic features such as fractures and veins which conduct water at rates similar to the overlying soil matrix.

Current rules allow for the use of saprolite if suitable characteristics (texture, mineralogy, wet consistence, stickiness, plasticity) are present two feet below the proposed trench bottom. The daily design flow shall not exceed 1000 gpd unless a special hydrologic study is done to show that the proposed system will function properly. The horizontal setback from a septic system to any well shall be 100 feet; this distance may not be reduced for any reason.

BRIEF BIOGRAPHY

Stan Crownover; originally from Tennessee; has lived in NC since 1995.

On-site wastewater supervisor and soil scientist--Buncombe County (1995 to present).

BA in Biology from the University of Tennessee(1978).
MS in Ecology from the University of Tennessee(1988).
PhD in Soil Science from the University of Florida (1992).

Has had a variety of jobs from research associate to soil conservationist to high school science teacher.

Professional interests include soil genesis, geomorphology and landscape evolution.

Saprolite-Wastewater Treatment Potential and Movement

Aziz Amoozegar
Soil Science, NC State University

A majority of the soils in the Piedmont and Mountain regions of North Carolina are underlain by saprolite at depth of less than 150 cm (5 ft). Saprolite has been defined as isovolumetrically weathered bedrock materials that is friable. Although saprolite had been permitted for wastewater disposal in a number of states in the southeastern region of the United States for many years, the North Carolina regulations that were developed in 1970's considered saprolite as bedrock material and deemed it unsuitable for use in septic systems. The current regulations, however, allow limited number of saprolites with certain characteristics to be used for subsurface wastewater disposal. These regulations were developed based on scientific studies that showed the banding and other special features of some saprolites inherited from their respective parent rock, and certain Mn/Fe filled fractures and quartz veins present in these saprolites do not conduct water at relatively high rates as compared to the saprolite matrix. Because of lack of soil structure, the planar voids in saprolite are mainly associated with fractures that may be sealed due to fillings by Mn and Fe oxides and overburden pressure. In addition, a saprolite may lack tubular pores due to a lack of root growth and animal borings. As a result, little macropore flow may occur, and most of the water flow and transport of pollutants would be through interparticles or matrix pores of these saprolites. In general, a well developed saprolite is composed of small particles with an affinity to adsorb water and attenuate pollutants through physical filteration and adsorption on the surface of the particles. In addition, because of lack of filling of the pores by small colloidal particles, the ability of these saprolites to transmit water (i.e., their hydraulic conductivity) may be as good as the Bt horizons of many soils that are routinely permitted for wastewater disposal. In this presentation, the properties of saprolite that are considered suitable for wastewater treatment and disposal will be compared to the corresponding properties of suitable soils in the Piedmont and Mountain regions of North Carolina.

BRIEF BIOGRAPHY

Biography:

Dr. Aziz Amoozegar completed his B.S. degree in General Agriculture at the Ahvaz Agricultural College in Iran in 1968. He started his graduate work at the University of Arizona in 1972 and completed his M.S. degree in Agricultural Chemistry and Soil in 1974. He continued his graduate work and received his Ph.D. in 1977, majoring in Soil and Water Science with a minor in Mathematics. He worked at the Soil, Water and Engineering Department at the University of Arizona from 1978 through 1983. In 1983 he joined the faculty in the Soil Science Department at NCSU as an Assistant Professor, and was promoted to Full Professor in 1995. His areas of expertise are in water movement and transport of pollutants through soils. His research focus at NCSU has been on on-site wastewater management and development of techniques for soil and site assessment. He is the inventor of the Compact Constant Head Permeameter for determining saturated hydraulic conductivity of unsaturated zone. His current research is focused on the role of capillary fringe in lateral transport of pollutants.

1-6 Emerging Trend to Improve Watershed Quality in Western North Carolina Using Multi-Agency Collaboration

Terrell Jones
NC DENR/DEH/Onsite Water Protection/WaDE

In 1995 legislators of western North Carolina and other mountain stakeholders held a Year of the Mountains Conference to identify barriers to economic development in the mountains. The group identified straight pipes and failing septic systems as one of the top ten barriers to sustainable economic development in the mountains with two main concerns. As western NC grows in population, the increased population growth expands into watersheds that are used for drinking water supplies. The costs and efforts to protect and treat surface water supplies for domestic use are a growing concern for town and county governments. On another front, tourism is one of the largest industries in western North Carolina and good water quality is an important part of that industry. Mountain streams and lakes attract hikers, rafting and boating enthusiasts and people who like to fish. If these waters are choked with algae blooms or muddy sediment or known to be contaminated with sewage there is a negative impact to the tourism industry.

Presented here are three examples of watershed restoration projects in the mountains that are making large scale improvements through collaboration with numerous agencies. Two of the examples are public water supply watersheds and one is a smaller watershed listed as impaired on the states 303d list of polluted streams. State agencies such as Division of Water Quality and Division of Environmental Health are working with county health departments, county Soil and Water Conservation offices, regional waterways associations, NC DOT, US Fish and Wildlife and US Forestry Dept. to monitor conditions and enforce actions. Collaborative efforts among agencies are supplemented by financial assistance to homeowners for low interest loans and grants from NC Clean Water Management Trust Fund."

BRIEF BIOGRAPHY

Terrell Jones is a NC Registered Environmental Health Specialist with a Masters In Health Policy and Administration from the UNC School of Public Health and has worked as a EHS (17.5 yrs) and health director (2.5 yrs) in the NC public health system since 1987.

The Importance of Site Assessment

Jim Beeson
S&EC, PA

The importance of site assessment is crucial in the project planning stage in that the site assessment reveals the type, capacity, and location of the septic system and repair area that will be required to successfully be permitted to safely dispose of the generated wastewater. The site assessment requires a preliminary evaluation of the entire property which gives a preliminary location of the most desirable area for disposal to the least desirable area for disposal. The preliminary evaluation may find that the site is not usable before a more intensive evaluation is performed. The Site assessment allows the best area to be chosen for the more intense detailed evaluation. The detailed evaluation includes the soil characterization, complete with deep borings, the hydraulic characterization, including conductivity, and the system layout. These must be accomplished before the system design can be performed correctly. The results, conclusions and methods must all be reviewed by the permitting agency. A professional approach with experience in the site assessment will speed up the permitting process and be more time efficient.

BRIEF BIOGRAPHY

Jim Beeson is the senior technical resource for the soil and site evaluation section of Soil & Environmental Consultants. For the last seventeen years Jim has specialized in evaluation of soils for both small and large scale wastewater disposal systems. Jim has also installed and designed wastewater disposal systems. Jim has been qualified as an expert witness in court cases that require expert wetness on such matters. Jim also directs developers in making decisions based on soils, environmental, and financial issues. Jim also assists clients in making applications for wastewater disposal systems.

Education

▪Bachelor of Science Degree in Agronomy- May 1984
North Carolina State University
▪Various short courses pertaining to septic systems, and hydrology

Professional experience

▪Company-wide technical resource director in the soils/wastewater disposal section of S&EC, PA. Jim works with soil scientists in three branch offices located across North Carolina in training and difficult matters pertaining to soils and system permitting. December 2005 - present
▪Soil and Environmental Consultants, P.A. Greensboro, NC
Branch manager of S&EC branch office. Daily responsibilities included running the Branch while also assisting clients. June 2004 - December 2005
▪Soil and Environmental Consultants, P.A. Raleigh, NC
Environmental consultant/Project manager and Vice President of environmental consulting firm specializing in site/soil evaluation for onsite wastewater treatment

2-2 The importance of Site Assessment to Design

Trish Angoli, OSWP

From the engineer's perspective, describes the impact of a site assessment on the engineering design of a subsurface wastewater system. A project design that was approved and has been installed is used to highlight the impact on system design.

BRIEF BIOGRAPHY

Tricia Angoli has Bachelors and Masters degrees in Civil Engineering from West Virginina University. She worked for the National Small Flows Clearinghouse for ten years, for a private consulting firm that dealt with onsite and small community subsurface wastewater systems, and is currently with the On-Site Water Protection Section.

2-3 Reuse Opportunities in North Carolina

Robert Rubin
McKim and Creed

Historically onsite systems have been viewed as septic systems and the goal of the treatment process was to maintain the liquid – and all that it contained – out of sight and out of public contact. Even with these restrictions, the water from an onsite wastewater system was reused as base flow in streams or recharge to aquifer systems. Interest in wastewater reuse is gaining in importance as a water management strategy.

Examples of water reuse are increasing throughout the nation. The City of New Bern operates a reuse system and transports high quality reclaimed water to athletic fields. The Bay River Sanitation District serving portions of Pamlico County is developing reuse efforts in River Dunes utilizing a combination of basins and irrigation.

Reuse efforts must embrace the whole gamut of possible opportunities for reuse. Traditionally irrigation and land based uses have dominated the discussion of reuse. Projects involving non-potable uses are emerging as tremendous opportunities to foster sound and sustainable water management efforts. The University of North Carolina at Chapel Hill is now contracting for over 0.5 MGD of reclaimed water for use in boilers and chillers.

Reuse programs are permitted at food processing and production facilities. Reclaimed water is used at these facilities for lot cleaning, boiler make-up and chiller water, misting operations to keep animals cool, and the initial animal washing operations. Reclaimed water meets standards imposed in rule. That water is a resource and should be considered as a tool in a comprehensive and sustainable water management program.

The best tool we have in our ruse efforts is educated advocates for these programs. The technology to achieve reclaimed water standards reliably and efficiently exists; personnel to operate, maintain and manage reuse systems are available; organizations to sustain these efforts are formed and regulated; and rules and regulations encouraging reuse are present at appropriate levels. The USEPA has a comprehensive guide available on reuse. Those Guidelines for Water Reuse are available from your EPA at:

www.epa.gov/ttbnrmrl

The updated 2004 Guidelines for Water Reuse document (EPA/625/R-04/108; August'2004) is distributed in both printed and CD formats by EPA's ORD/Technology Transfer Program as one of their Manuals of Practice. It is listed under "Waste Water" near the bottom of the middle column of manuals listed on that webpage. It presents and summarizes recommended water reuse guidelines for a wide range of reuse practices (e.g., both agricultural and urban irrigation, industrial reuse [e.g., cooling water, boiler make-up water, industrial process water], impoundment and stream augmentation, groundwater recharge, and indirect potable reuse), along with supporting information, as guidance for the benefit of the water and wastewater utilities and regulatory agencies, particularly in the U.S.

The revised reuse document updates the 1992 Guidelines by incorporating information on water reuse that has been developed since the 1992 version of the Guidelines document was issued. It includes many new and updated case studies along with expanded

coverage of coverage of indirect potable reuse and issues associated with various water reuse practices, industrial reuse issues, new information on treatment and disinfection technologies, emerging chemicals and pathogens of concern, current information on economics, user rates and funding alternatives, summaries of efforts to address public involvement and acceptance (both successes and failures), as well as research activities and studies conducted by the National Research Council, WERF, etc., and sources of further information

It also includes as an updated matrix of state regulations and guidelines, and a list of state contacts, as well as information about reuse practices in other countries. This information was put together in a manner that should be useful to states in developing water reuse standards, and revising or expanding existing regulations as well as to planners, consulting engineers and others actively involved in the evaluation, planning, design, operation & maintenance of water reclamation and reuse facilities.

Reuse is an integral component in our developing water management strategy. Fears and misunderstandings abound. Through education and demonstration, research and development, and proper management reuse will become integrated into the water management paradigm.

BRIEF BIOGRAPHY

Dr Rubin was educated at the University of California and NCSU/UNC. His training is in education, public health, chemistry and biology. He is an emeritus professor in BAE and senior environmental scientist at McKim and Creed. Prior to retiring, he spent 5 years with USEPA assisting with development of decentralized wastewater system and reuse guidelines.

2-4 Drip Design in the NC Mountains

Mark C. Brooks and Matt Rice
Brooks Engineering, Associates, P.A.

Drip dispersal systems have gained a more widespread acceptance among county health departments, environmental professionals, homebuilders, developers and the real estate market. As the design and use of these systems has become more widespread, the experience among design professionals has increased and so has the scrutiny under which these systems are reviewed. Design of drip systems can be characterized in many different lights from a rather simple “plug and play” pre-engineered system to a highly complex pressurized system with hydraulic characteristics that are difficult to model and calculate. This presentation will bring to light both the simplicity or these systems and the complexities.

Design and installation in the NC mountain areas has its own set of unique design challenges that may include high hydraulic heads and possibly radically varying head conditions between zones. Installation difficulties may include steep slopes or site encumbrances such as rock outcroppings. Common design and installation issues will be covered along with discussion of new trends and potential rule changes.

BRIEF BIOGRAPHY

Mr. Mark Brooks, P.E. is a registered Professional Engineer in North and South Carolina. He has a Masters Degree from Montana State University in Civil/Environmental Engineering and Bachelors Degree in Economics from the University of North Carolina at Chapel Hill. He has over 14 years in the engineering design and consulting business. Mr. Brooks works on a wide variety of civil and environmental engineering projects as President and Senior Engineer for Brooks Engineering, P.A., which is a multi-disciplinary engineering firm offering civil engineering, environmental engineering, soil science, surveying, and environmental services.

2-5 High Strength Wastewater: Characteristics and Treatment

Mark Lubbers
Aquapoint, Inc.

Unlike municipal waste streams wastewater generated from decentralized and on site facilities have unique characteristics that must be understood in designing wastewater treatment systems. The paper will examine the sources, characteristics and constituents of high strength wastewater, the importance of source control, and treatment system design considerations to assure compliance with permit requirements. A review of some available treatment methods is presented. Recommendations for best management practices, policies and procedures to successfully treat high strength wastewater are discussed.

BRIEF BIOGRAPHY

Mark Lubbers is VP of Sales for Aquapoint, Inc. where he has worked for the past 14 years. Mark holds a Masters degree in Aquatic Biology from Southern Connecticut State University. He is a former regulator with 10 years experience as Executive Director of Environmental Protection for City of Stamford, Connecticut where he was responsible for management of water resources, flood control, conservation and Coastal Area Management. In addition to his responsibilities at Aquapoint, Mark is currently working on a demonstration project for the Government off the Bahamas under the Global Environment Facility (GEF), Integrating Watershed and Coastal Area Management (IWCAM) program. He has published and presented papers for the International Symposium for Urban Hydrology, Hydraulics & Sediment Control and for NOWRA. Mark has been a consulting environmental scientist to engineering & law firms and to the US EPA for the Long Island Sound Study Land Use Work Group. Throughout his career he has served on a variety of state and local boards and commissions dealing with conservation, land use and water pollution control and has held a Class 4 wastewater treatment plant operators license. Mark also has 5 years experience as a residential developer and home builder. This varied background provides Mark with a unique perspective on the challenges in protecting ground and surface water resources.

2-6 The Next 25 Years, A Discussion about Small Sewer System Ownership, How to Get Today's System to the Next 25 years.

Bill Freed
Enviro-Tech NC

This is not a crystal ball discussion about pretending to know where the industry is going or what our concerns and priorities as an industry will be in 25 years. This is a discussion about how to make sure the systems and infrastructure that are already in the ground or on paper will be here and beneficially functional in 25 years. The presentation will cover what appear to be the most important aspects of system ownership.

- Accepting that the wastewater system must be sustainable for perpetuity. Definition of Sustainability, not pie in the sky political talk or sales talk, sustainability through setting rates that will support and replace the system over time. Sustainability through proactive maintenance and operation.
- Proactive operation and maintenance, incorporating an operation, maintenance plan that covers 10 years and a budget that covers 20 or 30 years. Discuss planned replacements instead of reactive replacements which will include discussion of depreciation and realistic life span of components. Discuss the details of maintaining a system to last for 40 years instead of just until the next report period or the next inspection. Discuss having the funds available to address the most minor issues before they become costly problems.
- Setting rates or budgeting ownership to support sustainability of the sewer system. Most larger on-site systems have more than one contributor or customer, they need to be aware of, or be charged the true cost of ownership for use of the system. Rates or operating budget need to be established on day one of operation that will support the system to the last day of operation which typically now is perpetuity. Starting early in building the financial security of a small wastewater system will lighten the load on the users down the road.
- System, technology and site selection at the design stage that will encourage reasonable cost of ownership and beneficial service to the community it serves and the surrounding community. In the site and technology selection process owners and engineers need to acknowledge honestly why they make the choices they make, then understand the concerns created by those choices and ultimately make sure the operation and ownership phase of the project is sensitive to the choices and concerns.

While it is important to look to the future as an industry to anticipate the challenges on the horizon, it is equally important to make sure the money in the ground today serves us well until the next set of challenges are fully understood.

BRIEF BIOGRAPHY

President of Enviro-Tech which is a conglomeration of 4 Companies.

- Enviro-Tech - Operations and maintenance
- Enviro-Tech Unlimited Construction Services - Unlimited General Contractor, Water and Wastewater Plants - Distribution and Collection.
- Creative Environmental Systems Sales - Sales Rep for Aquapoint.
- Enviro-Tech of North Carolina Inc. - A North Carolina franchised Public Utility providing sewer service.

Bill started out as an operator helper in about 1985, discovered his personal passion for the process and the industry. While he does not consider himself a visionary or any other of the insightful or intellectual types, he admits to somehow knowing early on that the small flow industry would grow and evolve, and then chose to grow and evolve with it.

3-1 Why the soil makes a difference

Dave Lindbo
Soil Science, NC State University

Most decentralized wastewater treatment systems are not direct discharge systems. Instead, they rely on subsurface dispersal and treatment of effluent in the soil. It is critical that the soil on a site be able to both *accept* and *treat* the wastewater that is applied. The ability to accept and treat wastewater is dependent upon many factors including topography, landscape position, and soil properties (e.g., texture, structure, soil minerals, depth to soil wetness, rock, or other limiting conditions) as well has how the soil/site was treated (manipulated) during construction. The bottom line regarding the soil/site is that during installation the natural ability and properties of the soil/site to treat and disperse wastewater must be maintained or improved. Ultimately, wastewater applied to the soil treatment area (drainfield) must go somewhere. In a properly installed and functioning system, it returns to the groundwater after it has been properly treated in the soil. It is important to consider that a wastewater treatment system is directly connected to the hydrologic cycle. Potable (drinking) water brought into the house from either ground (wells) or surface water (reservoirs) leaves the house as wastewater. One way or another it will always make its way back to groundwater or surface water. The goal with a wastewater treatment system is to ensure the wastewater is treated before being dispersed back into the environment (groundwater and/or surface water). A permit for a decentralized system will not be issued for a site if it is determined that the wastewater can not be properly treated and dispersed. It is important to understand that not all sites are suitable.

BRIEF BIOGRAPHY

Since 1995 – Soil Extension Specialist, Soil Science Department NC State University
1994-1995 – Research Associate/Adjunct Assistant Professor, Univ. of Mass.
1991-1994 – Soil Scientist, USDA-ARS, Oxford, Mississippi
1990-1991 – Research Associate/Adjunct Assistant Professor, Univ. of Mass.
1988-1990 – Lab Manager, Howard Labs, Amherst, Mass.
1984-1990 – Graduate Student, Univ. of Mass.
1982-1984 – Graduate Student, Univ. of New Hampshire
1979-1982 – Student, Univ. of New Hampshire

1982 BS Environmental Conservation/Geology Option, Univ. of New Hampshire
1984 MS Soil Science, Univ. of New Hampshire
1990 MS Geology, Univ. of Mass.
1990 PhD Soil Science, Univ. of Mass.

3-2 Reading & understanding onsite permits

Kevin Neal
OSWP

This presentation will help contractors understand the basic information that is generated by the local health departments for on-site waste water system installations. It will go over what to ask the environmental health specialist if the site has been altered or does not match the construction authorization. The main point is the septic installer and the local health department must work together as a team so the system can be installed correctly and by the rules.

BRIEF BIOGRAPHY

Kevin graduated from North Carolina A&T in 1990 with a BS in soil science and a MS in Plant and Soil Science in 1992. He worked with the Guilford County Health department from 1993 – 1996 as an Environmental Health Specialist. He accepted the position of Soil Scientist with the Forsyth County Health Department in 1996 – 2002. In 2002, he accepted the position of Regional Soil Scientist for NCDENR.

3-3 Why Environmental Health Specialists Ask and Do What They Do

Andy Adams
Orange Co. Health Dept. and
Steve Bristow
Wake Co. Env. Services

Environmental Health Specialists can seem like the hardest people in the world to please sometimes. Each encounter between them and the community of professionals whose work they regulate can potentially introduce their regulated constituents to a previously un-encountered area of rules, policy, or procedure.

In addition to conducting evaluations and inspections related to the permitting process, Environmental Health Specialists ask for a lot of information along the way. The information is needed to help them better understand the project before them and ensure that everyone will know what is expected of them to bring it to a successful conclusion.

Covering permitting informational needs, inspection procedure, and the importance of effective communication, this talk discusses some of the more common areas of what Environmental Health Specialists need and do to insure compliance with State and Local Rules, Policy, or Procedure, and why they need the information they ask for.

BRIEF BIOGRAPHY

Steve Bristow, Environmental Engineer, Wake County Division of Environmental Services, Raleigh NC

B.S. Soil Science NCSU 1981
1982 to 1984 McDowell and Stokes County Soil Surveys with NCDNR&CD
1984 to 1987 Wake County Health Department Environmental Health Specialist
1987 to 1989 Wake County Health Department Environmental Health Specialist Team Leader
1989 to present Wake County Environmental Engineer Wake County Division of Environmental Services
1982 to present Member of the Soil Science Society of North Carolina, 2005 president
2000-2006 Member of the North Carolina Board for Licensing Soil Scientists.

Andy Adams , R.S., Orange County Environmental Health Supervisor

1981 - B. A. in Environmental Studies with a concentration in Earth Science from the University of North Carolina at Wilmington
1982 to present: Registered (#766) by the North Carolina R.S. Board as a Registered Sanitarian.
1992 to present: Subsurface Wastewater System Operator (#12091)

Previous related positions held in locations other than the current local health agency:
1981 - 1983 - Sanitarian: Pender County Health Department
1983 - 1987 - Sanitarian/Environmental Health Specialist: Randolph County
1987 - 1989 - Environmental Health Specialist: Rockingham County
1989 - 1998 - Environmental Health Supervisor: Alamance County
1998 - 2004 – Environmental Specialist: Onsite Wastewater Section, Division of Environmental Health, DENR

2004 – 2007 – Section Chief, Onsite Wastewater Section (now called Onsite Water Protection Section), Division of Environmental Health, DENR

2007 – as long as they will put up with me:

Environmental Health Supervisor: Orange County

3-4 Pump Distribution: Manifold & Manatees design

Wayne Jones
Randolph Co., HD

Wastewater system designs are as varied as the people who design them. Each design is unique to the site and the designer. Each designer uses techniques that are the most appealing to him and his experience. One of these techniques is pressure manifold distribution. Pressure manifold distribution, though not addressed in the North Carolina onsite rules, is a valuable design tool that when properly designed and constructed, can improve the performance and life of a septic system. A pressure manifold is a simple and inexpensive distribution device that can be added to any dosed wastewater system. The pressure manifold when properly designed delivers a specified amount of water to each trench. Ideally pressure manifolds are used when the trenches are of equal length but a manifold can be designed to accommodate unequal length lines. The purpose of this presentation is to provide a basic overview pressure manifold distribution devices and the key components necessary to for proper construction, operation and maintenance.

BRIEF BIOGRAPHY

1991 Graduate of Pfeiffer College
BS Sports Medicine

16 years with Randolph County

9 years I & E Committee member

3-5 Reuse Installations

Robert Rubin
Senior Environmental Scientist, McKim and Creed

Water reuse is gaining mainstream attention throughout the nation as a reliable and robust source for water. The NC Drought Management Council through the Drought Management Bill recognizes that reclaimed water is a critical source of water to satisfy increasing demands on water systems. Reclaimed water is permitted for use in a variety of indoor and outdoor applications.

Indoors reclaimed water can be incorporated into a dual plumbing system and used for toilet flushing, heating and cooling make-up, or fire protection (in large building applications). In the RTP area, reclaimed water is used in the building plumbing at the Triangle Wastewater Facility. New campus installations at UNC-CH incorporate dual plumbing in the Genomic Science building. The plumbing is properly coded and identified to mitigate adverse consequence through inadvertent cross-connection. Other examples exist in NC.

Within these buildings, pipe size is critical. Fire flows require large volumes of water in a very short time period; pipe must be sized appropriately to accommodate these large volume/high pressure applications. Further, pipe materials must be selected carefully to minimize potential down – times during maintenance and repair. Make – up water for heating and cooling will become an increasingly important use for reclaimed water. The Chiller facilities at UNC now utilize over 1 MGD of reclaimed water and the chiller at the Valero Fuel Operation in York River, Virginia has requested an additional 0.5 MGD reclaimed water capacity; bringing total reuse to over 1 MGD.

Outdoor applications continue to develop. The historical uses such as irrigation will provide seasonal applications for reuse water. Increasingly reclaimed water can be used for pressure washing applications, dust control, and wetland augmentation. Some states allow reclaimed water in aquifer storage and recovery applications.

The USEPA has a Guideline for Water Reuse that serves as a valuable resource for individuals planning, designing, operating or permitting a reuse project. That publication is available from your environmental protection agency as: EPA 625 – R – 04 – 016. This document is a valuable resource for anyone involved in or contemplating a reuse effort. The document can be downloaded from the USEPA website at www.epa.gov/owm.

BRIEF BIOGRAPHY

Dr Rubin was educated at the University of California and NCSU/UNC. His training is in education, public health, chemistry and biology. He is an emeritus professor in BAE and senior environmental scientist at McKim and Creed. Prior to retiring, he spent 5 years with USEPA assisting with development of decentralized wastewater system and reuse guidelines.

3-6 Problems at time of installation

Albert Mills
Orange Co., HD

Have you every gone to a job site and things were not as they were shown on the permit you had from the health department? Or you have started digging and you (fill in the blank). What should you do? This talk will address some of the things that may happen and what the response should be. .

BRIEF BIOGRAPHY

Graduated NCSU with a degree in soil Science in 1976, worked for the USDA-SCS now NRCS mapping soils in Cumberland and Hoke counties until 1979, worked for the Alamance County HD as a Soil Scientist until 1986, went to work for the Durham County HD as a Soil Scientist until 1988 when the Durham County HD started the first Monitoring and Maintenance Program, worked with Daryl Poe in the M&M program until 1992, worked with the DWQ-Training and Certification Unit and the WPCSOCC helping to train subsurface operators until 1993 when an opportunity to put words into practice came along to work for HARRCO Utility, Inc. when HARRCO was appointed the Emergency Operator for the North State Utility systems in Wake, Durham , and Orange counties, worked as subsurface operator for HARRCO until the "big blow of 1996" known as Hurricane Fran hit in September, continued to work with HARRCO as an equipment operator installing water, sewer, and storm-drain piping until 1999 when HARRCO when out of business, worked with Overbey's Septic Tank Service doing soil consulting, system layout, system installation, O&M inspections on subsurface, and other related duties associated with septic tank system installation and maintenance until 2005, currently working for the Orange County HD as EHS.

4-1 Evolution of Decentralized Management

Nancy Deal
Soil Science NC State University

Soil-based systems are not a 'new' technology. This session provides an account of how the goals of wastewater treatment have changed in the past century and highlights the importance of management as a means of improving system longevity and performance.

BRIEF BIOGRAPHY

Ms. Deal is an Extension Associate with NC State University Soil Science Cooperative Extension and an adjunct lecturer with East Carolina University. She develops curricula and delivers training, education and technical assistance to homeowners, small communities, onsite professionals and local units of government regarding decentralized wastewater treatment. She has served as Project Manager and writer on numerous projects conducted by the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT). Ms. Deal is also engaged in research on system malfunction as related to best management practices (BMPs). She earned a BS from the Pennsylvania State University and an MS from NC State.

4-2 Site Evaluation

Heath Ward
Guilford Co. HD

Site characteristics are the first things seen when the site is visited. In the broadest sense, topography describes the physical features of the land surface including relative elevations and the aspect of the surface. Landscape position describes the location of the site relative to the location on a slope. Landscape description refers to the shape of the slope both perpendicular to the contour as well as parallel to it. All characteristics of the topography and landscape position still influence the way that water moves both on and within the soil. For example, the site may be at the summit (top) or the bottom (toe) of a slope. This determines the nature of surface water movement. The upslope portions of the landscape have good external drainage as water flows away from them. The site conditions control external drainage whereas the soil properties control internal drainage.

BRIEF BIOGRAPHY

93-'96 employed by Randolph Co. Health Department in On-site program

'96 – present Guilford County Environmental Health in On-site program

Became Program Specialist in '98 with responsibilities including major subdivision review and commercial development.

Currently reviews and large system approval

4-3 Soil Evaluation

Albert Mills
Orange Co. HD

Because soils are a natural material, some variability on the site is to be expected. But when is the variability of concern to the evaluator/installer and when should one seek assistance? The only way to know what soil is expected on the site is to be able to read and understand a soil/site report. Once familiar with the nomenclature, definitions, and interpretations, the installer is better able to know when a second opinion or clarification is needed. This presentation discusses the typical soil properties found on a soil log (or profile description) as well as their relation to wastewater and installation.

BRIEF BIOGRAPHY

Graduated NCSU with a degree in soil Science in 1976, worked for the USDA-SCS now NRCS mapping soils in Cumberland and Hoke counties until 1979, worked for the Alamance County HD as a Soil Scientist until 1986, went to work for the Durham County HD as a Soil Scientist until 1988 when the Durham County HD started the first Monitoring and Maintenance Program, worked with Daryl Poe in the M&M program until 1992, worked with the DWQ-Training and Certification Unit and the WPCSOCC helping to train subsurface operators until 1993 when an opportunity to put words into practice came along to work for HARRCO Utility, Inc. when HARRCO was appointed the Emergency Operator for the North State Utility systems in Wake, Durham , and Orange counties, worked as subsurface operator for HARRCO until the "big blow of 1996" known as Hurricane Fran hit in September, continued to work with HARRCO as an equipment operator installing water, sewer, and storm-drain piping until 1999 when HARRCO when out of business, worked with Overbey's Septic Tank Service doing soil consulting, system layout, system installation, O&M inspections on subsurface, and other related duties associated with septic tank system installation and maintenance until 2005, currently working for the Orange County HD as EHS.

4-4 Water flow

Scott Greene
Guildford Co. HD

Typically, wastewater infiltrating the soil moves vertically downward until it reaches a water table or an impermeable layer. Once the wastewater reaches the impermeable layer, it accumulates and flows down gradient. This will again be in the downhill direction according to the topography. Because the maximum rate of water movement in the unsaturated zone below the bottom of the trenches is dependent upon the least permeable soil layer within the specified separation to a limiting condition, loading rates are based upon the information revealed during the soil and site evaluation, including texture, structure, and consistence.

BRIEF BIOGRAPHY

Environmental Health Program Specialist for 3 years Guilford County

21 years total with local health dept and NCDENR

BS Environmental Health and MS Soil Science

Scott loves long walks on the beach

6-1 The ABC's of Small Treatment System Maintenance

Steve Barry
AQWA

Presentation regarding the air and water flow issues relating to small wastewater treatment systems in the Carolinas. When troubleshooting a treatment systems you have to mind the 'Airway, Breathing, and Circulation' of a system just like you would for a human patient.

Case studies and field examples will be presented.

BRIEF BIOGRAPHY

Steve Barry is a registered sanitarian and a small business owner in North Carolina. His comapny, AQWA, operates out of Wilson. AQWA operates over 200 pretreatment systems in the Carolinas ranging in flows from 240 GPD to 60,000 GPD. AQWA has been in business for nearly 7 years.

6-2 Pump Styles: Understanding the Differences between Grinder Pumps, Sewage Pumps, & Dewatering Pumps

Darren, Meyers
Zoeller

In the sump, sewage, and effluent worlds pumping is a common practice. Pumps are used sometimes out of necessity and other times out of convenience. All too often, pumps are selected on a whim or for the wrong reasons. As with most other things in life, one size does not fit all. Specific pump designs have arisen in order to meet the specific demands of a given application. Three of the most common styles of pumps are grinders, sewage ejectors, and dewatering pumps. Understanding the differences between these differing styles can give the design specialist or installer greater confidence with pumping systems. A properly selected and applied pump will provide a long service life with few complications. Selection of an incorrect pump, by comparison, costs more time and money in the long run for everyone involved.

Before sizing and selecting a pump, it is important to consider the application. What is the material that is being pumped? Sewage is defined as raw wastewater coming directly from toilettes, showers, sinks, etc., and consists of both solids and liquids. Effluent is defined as the liquid that passes beyond a properly operating septic tank. In the septic tank, solids settle out and break down, while fats, oils, and greases rise to and are trapped at the surface. The middle effluent layer is a relatively clear liquid with minimal solids. Groundwater, as the name implies, is water that has infiltrated down through or up from the soil. Groundwater may contain some amount of silt (when entering a sump), but is typically clean and clear with no large particles. Understanding the category and characteristics of the material to be pumped is important for a high quality installation.

Sewage pumps and grinder pumps are both appropriate for use in a sewage environment. Despite the fact that the names for these two pumps styles are sometimes used interchangeably, they have distinct designs. A sewage pump, also referred to as a sewage ejector or non-clog, is intended to move sewage, solids intact, from a pit. A sewage pump has a large internal clearance which allows solids in the water to pass through the pump. Because solids will be present, it is important that the piping system be large enough to accommodate the solids without clogging. Sewage pumps are generally characterized by relatively low head pressures but high flows.

Grinder pumps are also intended for use in sewage environments. However, grinder pumps use cutters or grinding mechanisms to chop and tear larger solids in the wastewater into very small bits, thereby creating a kind of liquid waste slurry. This material can then be passed into small diameter piping systems since the potential for line clogging is greatly reduced. Different designs exist for grinder pumps, but they are most commonly characterized by high heads and low flows. This makes them well suited for use in pressure sewer applications where multiple homes are connected to a common pressurized force main. The pumps must have enough head capacity to overcome the pressure in the main and move the wastewater to its destination.

A common mistake in the onsite wastewater industry is to use a grinder pump to move sewage into a septic tank. In onsite applications where site topography will not allow sewage from a building to gravity flow into a septic tank, a sewage basin must be installed. This basin is typically 18” to 36” in diameter and receives all the waste generated within the building. A

pump or pumps then move the sewage up in elevation to where a septic tank can be installed. If a grinder pump is used to move sewage into a septic tank, the septic tank will lose treatment efficiency. Septic tanks work primarily due to settling action. Solids in a septic tank settle out slowly while the water works its way through the system. If the solids are ground into small pieces when they enter the tank, it will take much longer for the solids to settle, thereby increasing the potential for solids to pass through and exit the tank. Whenever it is necessary to pump sewage up into a septic tank, a sewage pump, rather than a grinder pump, is the appropriate choice.

Dewatering (as from a sump pit) and effluent pumping applications are often very similar. Both involve pumping liquid that contains little or no solids. Because of this, the line that separates dewatering pumps from effluent pumps is blurred. Many pumps are appropriate for use in either application. These pumps contain tighter tolerances that allow the pumps to move water more efficiently than sewage pumps. These tighter tolerances, however, mean that the pumps have a greater potential to plug up should they not be adequately protected from solids. In an effluent pumping application, it is a good idea to screen the effluent with a septic tank effluent filter as it leaves the tank. This will protect not only the pump, but also the drain field that receives the finished water.

The primary difference between effluent and dewatering pumps revolves mainly around the control mechanism rather than the actual pump. Pumps designed to move groundwater often have an integral float switch on the side of the pump. During normal operation, the water level in a sump pit will rise and fall exposing parts of the pump. In a groundwater application, this is fine. However, in an effluent application, corrosive gasses exist which can attack the exposed parts of a pump. Therefore, it is important to use pump activation mechanisms which will keep the pump fully submerged in the effluent at all times. This eliminates the use of pumps with the integral side switches. Effluent and dewatering pumps are generally characterized by a good balance of head and flow. Many onsite wastewater dosing applications require that a pump generate enough head to pressurize a set of lateral lines. Depending on the specific type of dosing system, the design point may require higher heads and lower flows, or vise versa.

In addition to understanding the different styles of pumps and their proper applications, it is important to understand that choosing the correct size of pump plays a huge role in the overall success of the application. A notion sometimes exists that if a small pump is good, a bigger pump is better. This idea is false. Each pump is designed to run within a certain head and flow range. A pump which is pushed to the extremes of its limitations, whether high or low, will fail prematurely. It is important to assess each application for the required head and flow, and then select a pump based upon that requirement. The age old practice of selecting a pump based solely on horsepower often causes more problems than it solves.

Applying pumps appropriately in applications is not difficult, but it does require some understanding and practice. Never hesitate to contact your pump supplier if you have questions or need assistance. There is no substitute for designing and installing a job right the first time!

BRIEF BIOGRAPHY

Darren Meyers, P.E. serves as the Application Engineer at the Zoeller Pump Company in Louisville, Kentucky. His position combines nearly all aspects of Onsite Wastewater System design, including pump and line sizing, floats and controls, biology, and treatment rates. He holds a Degree in Civil Engineering from the University of Dayton in Dayton, Ohio, and is a

licensed Professional Engineer in the States of Kentucky and Kansas. His experience in the water and wastewater industries includes work with municipal, private residential, and community projects.

6-3 Grey Water Systems and Use

Charles P. Gerba
University of Arizona

Grey water is the water originating from non-toilet sources such sinks, bathtubs, showers and washing machines. This water can contain human pathogens and for this reason residential use for landscaping has not generally been allowed in the past. A recent survey in Pima County Arizona suggested that approximately 8-10% of the households were practicing grey water reuse. Most of the grey water resulted from laundry wash water. Several studies were conducted at the University of Arizona on the quality of grey water from various households and in pilot programs of grey water treatment and storage to assess the risk of infectious disease transmission by grey water from different sources in the household after use for landscape irrigation. Recommendations were made based on these studies for minimizing these risks. This lead to ordinance changes for grey water use in the state and its approval for use in Pima County Arizona. A new county ordinance will require that new homes be fitted to allow for on-site grey water reuse.

BRIEF BIOGRAPHY

Charles Gerba is a Professor of Environmental Microbiology at the University of Arizona. He has published over 500 articles and several books on environmental microbiology and pollution science. His research focuses on safety of wastewater, biosolids and graywater reuse, and microbial risk assessment.

6-4 Compliance vs. Non Compliance vs. Failure

William G. Freed
Enviro-Tech
Rob Crawford
Dare County HD

This discussion will be a very interactive discussion about the difference between system Compliance and Failure and the steps along the way. We will also discuss how a system may experience Failure while through it life cycle was Compliant with its permit and from the other side of the spectrum systems that my have been Non-Compliant with the permit however ultimately have not failed.

Rob Crawford of Dare County Health will discuss how the regulations address the difference between Failure and Compliance.

Extra time will be allowed in this discussion for the audience to ask questions and have an open forum discussion on the vast gray area that lies between Failure and Compliance.

BRIEF BIOGRAPHY

President of Enviro-Tech which is a conglomeration of 4 Companies.

- Enviro-Tech - Operations and maintenance
- Enviro-Tech Unlimited Construction Services - Unlimited General Contractor, Water and Wastewater Plants - Distribution and Collection.
- Creative Environmental Systems Sales - Sales Rep for Aquapoint.
- Enviro-Tech of North Carolina Inc. - A North Carolina franchised Public Utility providing sewer service.

Bill started out as an operator helper in about 1985 and discovered his personal passion for the process and the industry. While he does not consider himself a visionary or any other of the insightful or intellectual types, he admits to somehow knowing early on that the small flow industry would grow and evolve, and then chose to grow and evolve with it.

6-5 NCOWCICB Rules

Gene Young
NCOWCICB and OSWP

This talk is on onsite wastewater proposed rules.

BRIEF BIOGRAPHY

Central Davidson High School 1970-1974

Davidson County Community College 1974-1976 AAS Degree in Soil and Water Conservation

NC A & T State University 1976-78 BS Degree in Soil Science

Davidson County Health Department 1984- June 1998
Registered Sanitarian since 1986
Davidson Counties first soil scientist in 1989
Licensed soil scientist in 1992

DENR-On-Site Wastewater Section July 1998-to present
Soil Scientist with Program Team July 1998-October 2001
Regional Soil Scientist October 2001-to present

Appointed by Governor Easley to NC Onsite Wastewater Contractor and Inspectors Board Oct 06
Board Chair January 2008 to present

NC Environmental Health State of Practice Committee-2002 to present

Married 29 years to Tonya

Member Clemmons First Baptist Church

Enjoy scuba diving and golf

6-6 Understanding/Troubleshooting Control Panels

Tim Bannister
TriCounty Wastewater and
Eric Valentine
American Mfg.

Tim and Eric will review the basic operation and troubleshooting techniques for common control systems including demand dosing, time dosing and innovative control systems. Tim and Eric will base this talk on real word scenarios as experienced on actual systems.

BRIEF BIOGRAPHY

Eric has been an employee of American Manufacturing Co for 16 years he is currently the National sales manager. Along with traditional sales activities He is also responsible for the coordination of and teaches at training and educational events for American. Eric has served on the boards of directors of the Virginia Environmental Health Association, VOWRA and DOWRA. Eric also instructs at several of the NC State subsurface operator, inspector and installer schools.

Tim is the owner of TCW Wastewater Management, Inc. and has been serving the industry for 19 years. TCW is a Consulting, Design, and O&M firm. Tim currently serves on several committees for North Carolina's Wastewater Industry; the Innovative and Experimental Committee, the Subsurface Operator Curriculum Committee, the NC Subsurface Rules Rewrite subcommittee, and the Home Inspectors Certification Curriculum Committee. He has also served as one of the instructors for the NC State's Soils and Onsite Training Academy and the Waste Water Biological Schools for several years. Tim also participated in an EPA funded national workshop in 2005 in California to discuss models for how long-term management of decentralized and distributed water resource infrastructure can be organized. The purpose was to explore the long-term viability and sustainability of certain models and assess how well each meets the needs and interests of the public.

7-1 Wastewater Loading Rates for Infinite Soil Component Life

E. Jerry Tyler
Tyler and Associates Inc.

Onsite wastewater infiltration rate into soil depends on the nature of soil clogging and soil characteristics. The rate of transmission of the infiltrated water through the soil away from the infiltration surface when a vertical flow restriction is present depends on the characteristics of the soil, the depth of the permeable soil horizons and the slope. Both infiltration loading rate and linear loading rate are related to soil unsaturated and saturated hydraulic conductivity that can be estimated from field described morphological characteristics. Linear loading rate is also related to the depth of soil for wastewater transmission and the slope. A single table is presented to estimate design infiltration loading and hydraulic linear loading rates for onsite wastewater treatment systems using field described soil morphological characteristics.

BRIEF BIOGRAPHY

Dr. Jerry Tyler is President of Tyler and Associates, Inc. and Emeritus Professor of Soil Science, University of Wisconsin-Madison. For over thirty years, Jerry conducted research on the acceptance and treatment of onsite wastewater by soil and provided training in Wisconsin on soil and site evaluation and design selection for wastewater treatment systems. Besides working on the Wisconsin Mound and At-Grade Manuals he developed tables of basal and linear loading rates based on soil morphological characteristics. In addition to soils consulting, Jerry is now developing design separation distances based on soil morphology, wastewater design loading rates and wastewater qualities. Jerry also continues to provide training about the use of soil for wastewater treatment in the classroom, field, and with his traveling soil laboratory.

7-2 Soils of the Piedmont

Joseph Kleiss
Soil Science, NC State University

The Piedmont region comprises about 39% of the state, and rising from about 200 feet at the fall line (dividing line between Piedmont and Coastal Plain) to nearly 1,500 feet at the base of the Appalachian Mountains. This area is typified by clayey residual soils, moderate and rolling relief, moderate to low base flows, and moderate to low infiltration capacity. The Piedmont is believed to be the foothills between the ancient Uwharrie Mountains and Appalachian Mountains. Uwharrie Mountains are now considered part of the Piedmont. The largest cities and highest population in NC are located in this region. Piedmont soils formed from a variety of igneous, metamorphic and sedimentary rocks resulting in several distinct soil systems in the region. In general the soils are very red to reddish and have clay content in their subsoil of 35% or greater.

BRIEF BIOGRAPHY

Native of Central Illinois
BS University of Illinois in Agricultural Science 1967
MS Iowa State University in Agronomy-Soil Science 1969
PhD University of Illinois in Pedology 1972

1972-1975 Soil Scientist/Ecologist with Dames and Moore Consultants in Park Ridge, Illinois

1975-present NCSU Department of Soil Science, presently Professor of Soil Science and Coordinator of Undergraduate Programs

7-3 “Tiger dirt” – What is it and what does it mean?

Roger Leab
NRCS

“Tiger Dirt” is a general term applied to soil horizons that have various types of patterned mottling. The most typical is reticulate or net-like mottling. Horizontally striped mottling is also common.

These types of patterned mottling are almost always found in soils which have formed in sedimentary deposits. Typically, these patterns develop in soil horizons directly above overlain residuum, older geologic formations, paleosols, strongly contrasting textures, or soil horizons with platy structure.

What causes these types of patterned mottling? They developed as redoximorphic features within soil horizons that are/were saturated with perched water for significant periods of time. The big question presented by “Tiger Dirt” is whether or not these soils have zones of saturation today or is the patterned mottling a relict feature.

BRIEF BIOGRAPHY

Roger J. Leab—born and raised in Rowan County, North Carolina. Graduated West Rowan High School in 1965.

Graduated with a BA degree in geology from Catawba College in 1969.

Worked for Kerr-McGee Corporation in underground uranium mining in New Mexico 1969-1972 and open-pit uranium mining in Wyoming 1972-1973.

Graduated in 1975 with a BS in Soil Science from North Carolina A&T State University.

Employed as a soil science student trainee with the Soil Conservation Service 1974-1975 in Guilford County.

Worked as a soil scientist with SCS/NRCS in Mecklenburg County 1975-1976; Bladen County 1976-1980; project leader in Bladen County 1980-1983; Stokes County 1983-1991; Surry County 1991-1997; Patrick County, Virginia 1997-2000; project leader of MLRA office in Greensboro 2000 to the present.

7-4 The Nitrogen Cycle in On-Site Wastewater Treatment Using Trickling Filter Technology

William E. Fenner, Jr.
Creative Environmental Systems

Nitrogen is a principle nutrient component in wastewater and a significant contributor to the contamination of groundwater below and around septic disposal/dispersal fields. This presentation will examine the biological treatment of wastewater focusing on trickling filter systems to implement the process of nitrification and denitrification to remove a majority of the nitrogen prior to the discharge from the treatment facility. The presentation will focus on the nitrification/denitrification process in small flow trickling filter style treatment systems and will examine the math behind the process and the management requirements for this process. The nitrification/denitrification process is required by the TS-II treatment standard.

BRIEF BIOGRAPHY

William Fenner, Jr., is a lifelong North Carolina resident and a graduate from NC State with a degree in Civil Engineering and a registered North Carolina Professional Engineer. He has a varied background that includes experience in the international oil exploration industry, highway design and traffic control engineering for NCDOT, site development planning and wastewater treatment system design and sales. He currently works as a sales representative for Bioclere Treatment Systems, Active Cell Treatment Systems and Aeration Products wastewater package treatment plants with Creative Environmental Systems and is associated with EnviroTech, a wastewater treatment operations and construction company.

7-5 EH rules at the Round Table

Topics for Discussion

4) Performance vs Prescriptive
5) LTAR – hydrologic vs organic
6) Mineralogy – Lab test that works?

8-1 Basic Hydrogeology

Rick Bolich
DWQ

North Carolina is a “geologically diverse” state with a wide range of rock types and geologic settings. Groundwater flowing through these different geologic environments presents many different challenges for safe and effective waste disposal practices. This presentation will provide a basic overview of hydrogeologic concepts with an emphasis on conditions found in North Carolina, and how these concepts and conditions apply to waste disposal practices. This presentation assumes the audience has an understanding of basic scientific and mathematic principals, but it is directed towards an audience with a minimal understanding of basic hydrogeologic conditions. The topics covered will be the hydrologic cycle, confined versus unconfined aquifers, transmissivity, storativity, hydraulic heads and gradients, groundwater flow and velocity, and well design considerations.

BRIEF BIOGRAPHY

Rick is the Senior Hydrogeologist in the NCDENR Division of Water Quality, Aquifer Protection Section. He is a licensed geologist in North Carolina and Virginia, and holds a B.S. degree in geology from the University of Miami (FL) and an M.S. degree in geology from the North Carolina State University.

8-2 Groundwater Contaminants

Walt Haven
OSWP

Over 50 percent of North Carolina residents rely on groundwater for their drinking water. The overall natural quality of groundwater in this state is excellent, however, sometimes the varied geology of North Carolina produces well water that has excessive levels of naturally occurring iron, arsenic, radon, or seawater. Additionally, movement of industrial contaminants through aquifers over time may also threaten some wells. A general understanding of groundwater flow, local geology, and surface water indicators provides insight into potential risk factors that may exist before the well is even drilled.

BRIEF BIOGRAPHY

Branch Head of DEH's Private Water Supply Branch
Licensed Professional Geologist
Previous experience - hazardous waste and groundwater contaminant site assessments, water reservoir and sedimentation assessments, geophysical surveys, water supply well studies.

8-3 Large System Site Assessments and the affects of hydrology

Don Wells
S&EC

Our soils and groundwater under natural conditions are in equilibrium with the prevailing hydrologic cycle in which the soil water and groundwater conditions are controlled by precipitation and evapotranspiration. This natural equilibrium is disturbed when a large wastewater disposal system is installed at a site. Therefore, understanding the behavior of groundwater as it is affected by a surface or subsurface wastewater disposal system is crucial in preserving the environment and public health. Large systems are being used and continued to be proposed for use all across North Carolina. The agencies in charge of regulating the environment, namely Division of Water Quality and Division of Environmental Health, not only are present to assure that all permitted systems are operating properly, but also should be involved from the initial stages of soil/site evaluation and designing these systems. Because large systems impact the hydrology of a site at much greater rate than individual systems, our focus on site evaluation should be expanded from just evaluating the upper portion of the soil by hand auger boring to assessing the soil profile using deep soil borings. In addition, we need to assess the impact that wastewater disposal may have on soil water and groundwater conditions. For this, we need to evaluate the soil at adequate number of locations and measure the hydraulic conductivity of both the unsaturated soil, where wastewater in introduced into the soil, and saturated zone when a relatively shallow groundwater is present. Measuring the hydraulic conductivity of the saturated zone, that is the aquifer, requires installation of wells and/or peizometers. During installation of wells and piezometers, we should describe the soil profile and estimate the depth to seasonal high water based on redoxomorphic features. In addition to determining topographic settings, drainage features, presence of streams, wells, and rock outcrops, the information collected during site evaluation should include its local geology and hydrogeology features based on available literature. Once all the field information is gathered, a groundwater mounding and/or water balance analysis should be performed to determine site suitability. In this presentation the general steps necessary to evaluate a site for a large wastewater disposal system will be presented.

BRIEF BIOGRAPHY

Donald Wells is a Licensed Soil Scientist (NC License No. 1099) and a Licensed Well Driller (NC License No. 3583-A) in North Carolina.

Mr. Wells has approximately 18 years working as a Professional Soil Scientist. He has developed and manages S&EC's Phase I Environmental Program and Underground Storage Tank Removal Program. He has helped prepare over 500 Phase I Environmental Assessments on all types and sizes of properties. Mr. Wells has worked with Phase I/Phase II Environmental Assessments for approximately 17 years and has worked with underground storage tank closures, assessment, and remediation for approximately 15 years.

He performs Hydraulic Conductivity and Infiltration Measurements in the Vadose Zone, Water Balance Analysis, Aquifer Testing and Analysis and Groundwater Monitoring.
He manages projects for large scale residential developments, municipal and local governments. He has also developed and manages S&EC's Certified Field Laboratory Operations, NC Lab #5531.

9-1 Tanks

Nancy Deal
Soil Science, NC State University

The septic tank is the first component in virtually every decentralized system used in North Carolina. This session discusses the wastewater treatment processes that occur in septic tanks, design features that improve tank function and facilitate O&M, and the importance of tank capacity and structural integrity.

BRIEF BIOGRAPHY

Ms. Deal is an Extension Associate with NC State University Soil Science Cooperative Extension and an adjunct lecturer with East Carolina University. She develops curricula and delivers training, education and technical assistance to homeowners, small communities, onsite professionals and local units of government regarding decentralized wastewater treatment. She has served as Project Manager and writer on numerous projects conducted by the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT). Ms. Deal is also engaged in research on system malfunction as related to best management practices (BMPs). She earned a BS from the Pennsylvania State University and an MS from NC State.

9-2 Pumps and Controls

Tim Banister
TCW

This session provides details on the design, component selection and configuration of systems used to deliver effluent under pressure. It includes discussions of pump curves, electromagnetic controls and dosing regimes, among other topids.

BRIEF BIOGRAPHY

Tim is the owner of TCW Wastewater Management, Inc. and has been serving the industry for 19 years. TCW is a Consulting, Design, and O&M firm. Tim currently serves on several committees for North Carolina's Wastewater Industry; the Innovative and Experimental Committee, the Subsurface Operator Curriculum Committee, the NC Subsurface Rules Rewrite subcommittee, and the Home Inspectors Certification Curriculum Committee. He has also served as one of the instructors for the NC State's Soils and Onsite Training Academy and the Waste Water Biological Schools for several years. Tim also participated in an EPA funded national workshop in 2005 in California to discuss models for how long-term management of decentralized and distributed water resource infrastructure can be organized. The purpose was to explore the long-term viability and sustainability of certain models and assess how well each meets the needs and interests of the public.

9-3 Pretreatment

Tim Crissman
OSWP

This session describes the principles of aerobically treating wastewater. It provides an overview of media filters and ATU's, their structure and function and how they are used in decentralized applications.

BRIEF BIOGRAPHY

Registered Sanitarian, Soil Scientist, Wilmington Regional Office, On-site Water Protection Section, Division Environmental Health, N.C. Dept. Environment and Natural Resources, November 2000 - present

Soil Scientist, Brunswick County Health Department, 1997 – 2000

Education:
B.S. Horticulture, N.C. A&T S.U., 1992
M.S. Plant and Soil Science, N.C. A&T S.U., 1996

9-4 Distribution

Nancy Deal
Soil Science, NC State University

All decentralized wastewater treatment systems (whether simple or complex) include components that distribute effluent to and among various components. The goal of distribution is to spread wastewater and effluent over space and time to allow physical, biological, and chemical treatment processes to effectively remove contaminants. This section provides an overview of how treatment can be maximized through design and installation practices that promote uniform distribution. It also emphasizes the importance of providing access for O&M to ensure continued performance and increase system longevity.

BRIEF BIOGRAPHY

Ms. Deal is an Extension Associate with NC State University Soil Science Cooperative Extension and an adjunct lecturer with East Carolina University. She develops curricula and delivers training, education and technical assistance to homeowners, small communities, onsite professionals and local units of government regarding decentralized wastewater treatment. She has served as Project Manager and writer on numerous projects conducted by the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT). Ms. Deal is also engaged in research on system malfunction as related to best management practices (BMPs). She earned a BS from the Pennsylvania State University and an MS from NC State.

10-1 Well construction: Siting and Safety Issues

Wilson Mize
OSWP

Properly locating a well from various sources of contamination is an extremely important aspect of protecting our ground water as well as protecting those utilizing wells for consumption. By examining the requirements set forth in 2C. 0100 we will be better able to require wells to be installed in areas that are less likely to cause contamination of that well. We will also look at safety concerns that should be addressed when working around drill rigs and make you aware of some of the dangers that you may not always consider.

BRIEF BIOGRAPHY

Wilson Mize, R.S., is currently a Regional Well Specialist for the On-Site Water Protection Section of the North Carolina Department of Environment and Natural Resources. In 2003, he worked for the Division of Water Quality, first as an inspector of waster water treatment plants, single-family spray systems, and oversaw the ambient monitoring program. He later served as the enforcement staff member for the Well Contractors Certification Commission. Prior to 2003, he worked for S&ME and assisted with the installation of monitoring wells, ground water and soil sample collection, and data collection.

10-2 On-site Water Treatment

Joe Harrison
Water Quality Association

An overview of household water treatment, including a description of the various point-of-use (POU) and point-of-entry (POE) products and water treatment technologies, and the types of water quality concerns of each will be covered. There will be a discussion of the ANSI/NSF standards for drinking water treatment unit products, how ion exchange water softeners and iron removal filters work, as well as popular other technologies such as reverse osmosis, carbon blocks, ultraviolet light, and the newer arsenic remediation filters.

BRIEF BIOGRAPHY

Joseph F. Harrison, P.E., CWS-VI, is the Technical Director for the Water Quality Association (WQA), having come to WQA in 1990. The Water Quality Association is a not-for-profit international trade association representing the residential, commercial, industrial and small community water treatment industry. Its membership consists of both manufacturers as well as dealers/distributors of equipment. With the WQA, Joe is a resource and information source, a voice for the industry, an educator of professionals, manager of a laboratory for product testing and industry standards, and a communicator with the public. WQA has more than 2,500 corporate members in the businesses of manufacturing, sales, installation, and service of water supply treatment nationwide.

Prior to his position with WQA, Mr. Harrison was Chief, Safe Drinking Water Branch for Region V of the U.S. Environmental Protection Agency for seventeen years. His many responsibilities with the EPA included the overview and enforcement of drinking water standards in Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin and protection of underground sources of drinking water in the region. He served as technical consultant on matters related to significance and resolution of drinking water contamination and health problems and participated in the development of U.S. EPA drinking water regulations.

Mr. Harrison is a registered professional engineer and holds the title of Certified Water Specialist VI in the Water Quality Association's voluntary certification program. He obtained a Bachelor of Science Degree in Civil Engineering from Wisconsin State University and holds both a Master of Science Degree in Water Resources Management and a Master of Science Degree in Environmental Engineering from University of Wisconsin, Madison.

10-3 Emerging Contaminant NonPoint Source Pollution Issues: Potential Health and Environmental Issues Involving Endocrine Disrupting Chemicals (EDCs) and Pharmaceuticals & Personal Care Products (PPCPs). Potential Effects on Wildlife and Humans: A Brief Description of Studies in the Upper Neuse River Basin, NC (Comparing POTWs and Septic System Treatment) And Some Potential Drinking Water Treatments.

Barbara Hartley Grimes
OSWP

Emerging NonPoint Source Pollution and Water issues now include the Emerging Contaminants: Endocrine Disrupting Chemicals (EDCs) and Pharmaceuticals & Personal Care Products (PPCPs). These pollutants have been identified in human and animal wastewater, surface and groundwater, and some drinking water samples nationally & globally. The environmental and potential human health effects of EDCs and PPCPs have been documented and are the subject of intensive research activities. This topic is further complicated by the fact that some PPCPs are also EDCs. Some examples of the many effects that have been documented with as a result of exposure to some emerging contaminants include: “gender bending” and environmental antibiotic resistance to one or more antibiotics. Although some of these contaminants are documented to pass through human (POTWs) and animal wastewater systems, few studies have examined onsite wastewater systems (septic systems) and the fate and transport of these chemicals through soil dispersal systems. In the Upper Neuse - the first study comparing septic systems to POTWs and a second spatial/temporal study at these sites with more of the functionality studies of hormonal activity at selected sites. Also sampled were upstream, at discharge point, and downstream of a municipal wastewater treatment plant (as well as background samples). Traditional pollutants, selected emerging contaminants, and many functional tests (EDCs) were run. These chemicals were examined and compared to the presence of nontraditional tracers (optical brighteners) from the PPCP list to document if they are useful in tracing waste and if they correlate with traditional pollutants. This first study and second studies are in the data analysis phase. The results for optical brighteners, EDC activity, chemical suites of traditional chemicals, and suites of Emerging contaminants will briefly be presented. In summary septic systems demonstrated significant treatment of emerging and traditional contaminants and POTWs (as reported in other literature) did not. Some potential drinking water treatments will briefly be described. These studies were funded by the NC EPA 319 Program to the Dr. Barbara Hartley Grimes in the Onsite Wastewater Branch (NCDENR) and are conducted in collaboration with USGS (Gloria Ferrell).Other researchers involved in the completed project were: Drs. Chuck Hagedorn (Virginia Tech), Bill Kirby-Smith (DUML) and Gerald LeBlanc (NCSU), Dr. Alexandria Graves (NCSU) and expertise were added to the project s.

BRIEF BIOGRAPHY

Education: Associate Liberal Arts St Mary’s and BS, MS, PhD from NCSU. Currently an EPA 319 NPS Coordinator (2000) coming from NCSU as a teaching and research faculty member since 1979. Interagency cooperation and emphasizing sound science based practices are a top priority in protecting human and environmental health. Areas of expertise include: microbiology, zoology, ecology, environmental issues, human health, MST, and wastewater treatment technologies. Activities include: Conducting 50-100/yr workshops; Initiating, writing, administering grants; Publishing and Conducting Research; Serving as liaison and committee member to 319 and DWQ. Has enriched life - as a poet, artist, and musician, with one son pursuing a Master’s in Civil Engineering at NCSU!

10-4 15A NCAC .0100 and .0200

David May and Debra Watts
NCDENR, DWQ, APS

Changes to 15A NCAC 2C .0100 Well Construction Standards

Recently the Environmental Management Commission approved the recommended changes from the Division of Water Quality for the 15A NCAC 2C .0100 Well Construction Standards. These rules are scheduled to go the State Rules Review Commission in April and are anticipated to be effective May 1, 2009. This discussion will talk about the process of the rule change, who was involved in the process,and what revisions are in the final recommended rule.

Permitted Wells under 15A NCAC 2C .0200. Well Construction Standards, Criteria and Standards Applicable to Injection Wells

Currently there is a House Bill 621 that is recommending a tax credit for purchase and installation of geothermal heat pumps, which by EPA definition, are injection wells. This is a brief discussion describing the types of injection wells that may be encountered by local health department staff, and which of these wells are required to be permitted.

BRIEF BIOGRAPHY

David May is a native of Johnston County, NC. He received a Bachelors degree in Geology from North Carolina State University. Mr. May is a North Carolina Professional Geologist and has experience with groundwater assessment and remediation projects, wastewater land application systems, and well construction. Mr. May is currently employed with the NC Division of Water Quality and is the Regional Supervisor of the Aquifer Protection Section in the Washington Regional Office.

Debra Watts received a Bachelors degree in Industrial Engineering from Arizona State University and a Masters degree in Engineering and Environmental Management from the Air Force Institute of Technology in Dayton Ohio. While serving in the Air Force, she was with the Air Force Center of Environmental Excellence, where she oversaw contamination cleanup on bases targeted for closure. She is currently employed with the NC Division of Water Quality, where she is the Supervisor for the Groundwater Protection Unit in the Aquifer Protection Section.

10-5 Common Misinterpretations of the Rules

Leslie Easter, Stokes Co. HD

5 rule books + 4 DENR sections + 2 DENR divisions = 1 well (and a lot of headaches)

With the private drinking water well program underway for almost 1 year, numerous questions and concerns are still floating among local health department environmental health staff. Do we permit this well? Do we sample this well? When do I use the .1700 rules? This presentation will focus on frequently asked questions, concerns, and rule interpretations. Learn when and how to use certain well rules as well as which agency to contact with questions.

BRIEF BIOGRAPHY

Leslie received her Bachelor's degree in Environmental Health Sciences in 2000 from Wright State University in Dayton, Ohio. She started her career in the classroom as an eighth grade science teacher in the Winston-Salem/Forsyth County School District and has continued to promote education and training in her jobs that have followed. The majority of her time in Environmental Health was spent as an Environmental Health Specialist for Forsyth County Dept. of Public Health in the On-Site Waste Water and Wells division, where she worked for nearly five years.

Leslie has also worked for NC Department of Environment and Natural Resources, Division of Environmental Health. She was one of four Regional Specialists who helped mold and shape the private drinking water well program into what it is today. Currently, she is the Environmental Health Supervisor for the Stokes Family Health Center.

10-6 Common Well Problems

John Nykamp, Guilford Co.

Drilled wells constructed in Guilford County are similar to thousands of drilled wells located throughout the Piedmont and Mountain regions of North Carolina. Guilford County is situated over three geologic formations; the Charlotte Belt, the Carolina Slate Belt, and the smaller Milton Belt. Drilled wells in Guilford County are open hole construction in igneous and metamorphic formations and vary in depth from eighty feet to over 1200 feet, with well yields of less than one pint per minute to over four hundred gallons per minute. Water chemistry is generally good, although it varies greatly, with pH ranging from 5.7 to 8.4 and hardness from 5 ppm to 1425 ppm. Well owners seem to accept the fact that extreme water chemistry may require some form of treatment if the water appears clear. However, they are not nearly so accepting of water that has a visible problem.

Obtaining clear water from a well requires understanding a combination of factors: well construction, pump installation, and well maintenance. Use of proper well construction techniques and knowledge of local geology ensures that the well is constructed in the best manner possible. The pump installation must be consistent with the intended use and yield characteristics of the well. Finally, the well owner must operate and maintain the well so that it will provide trouble-free clear water on a consistent basis. Failure to consider all aspects of well construction, pump installation and well operation can create a water quality problem.

The source or sources of the problem can be biological, geological, hydraulic, physical, or a combination of sources. Locating the source of the problem can sometimes be as easy as looking at a sediment filter. In other cases the well construction record or pump installation record can provide a big clue. Use of a downhole video camera can tell us what is happening in the well when the well is in operation. After the source has been determined, recommendations can be made to correct the situation. This presentation will show water quality problems, their sources, and possible solutions.

BRIEF BIOGRAPHY

John Nykamp received a B.S. in biology from Bucknell University in Lewisburg, Pennsylvania. He started with the Guilford County Health Department as an Environmental Health Specialist in December 1992, inspecting septic system and well installations. In 1996, Guilford County purchased a camera for downhole video inspections and he became the lead camera operator. As an Environmental Health Program Specialist, he reviews water sample data and troubleshoots well and water quality problems in addition to operating the downhole camera. Since 1998, Mr. Nykamp has been an instructor at workshops sponsored by the NC Environmental Health State of Practice Committee and is currently Secretary of the State of Practice Committee. Mr. Nykamp presented “The Role of Proper Well Cleaning in Improving Public Health” at the National Groundwater Association’s 2005 National Expo. He has also made presentations to the North Carolina Ground Water Association and other organizations. He is a North Carolina Certified Well Contractor. In October 2007 he was appointed to the North Carolina Well Contractors’ Certification Commission and is currently the commission chairman.

11-1 Overview of Proposed Changes to OSWW Rules

Ted Lyon
OSWP

A overview of changes proposed to the On-Site Wastewater Rules. Attendees will hear new developments regarding new and existing on-site wastewater rules. This includes discussions of new rules that are being added for off-site systems, Rule .1970 modifications to address reuse, and sections of existing rules that have been separated into new rules.

BRIEF BIOGRAPHY

BS, MS. from NCSU
Mapped soil, Johnson County HD,
NCDENR Solid Waste,
NCDENR OSWP

11-2 Onslow's Off-site Septic System Ordinance - Getting all the Players to the Table

Angie Manning,
Onslow County Planning Dept.
Diana Rashash,
NC Cooperative Extension
Jon Harrison,
Onslow County Health Dept.

The amendments to Onslow's Subdivision Ordinance regarding off-site septic systems came at the request of the Planning Board to address a growing trend of homeowners being unaware that they own such systems. When septic systems go unmaintained, they can fail and become health and safety hazards before it is realized. The Subdivision Ordinance amendment was in three parts: to limit the use of individual off-site septic systems, to establish standards for individual off-site septic systems, and to permit a soil scientist certification in lieu of improvement permits for final plats. Ultimately, the second and third portions were approved by the Onslow County Commissioners.

BRIEF BIOGRAPHY

Angie Manning, AICP, Land Use Administrator, Onslow County Planning & Development.

Angie has been with the Onslow County Planning & Development Department since June of 2002 after previously working with the department in 1988-89. She graduated from Meredith College with a degree in Political Studies with a concentration in Public Administration and minors in Business Administration and Professional Communications. She has worked as a planner for the City of Jacksonville and also worked part-time with her husband in private business while her children were younger. Angie is a member of the American Institute of Certified Planners. She enjoys the challenges of bringing citizens, developers and public agencies together to achieve workable solutions to community problems.

Dr. Diana Rashash has been an Area Specialized Agent-Natural Resources for NC Cooperative Extension since 1996. As such, she deals with various water and wastewater issues. Diana is currently the NCCE designee to the NC Onsite Wastewater Contractors & Inspectors Certification Board.

Jon was a 1982 graduate of NCSU with a degree in Wildlife Biology. He began his Environmental Health career as a Sanitarian Intern in March 1984 and continues to serve Onslow County today as its Environmental Health Director. Jon was selected to be an original member of OSSPAC (On-Site Sewage Program Advisory Committee) in 1990. OSSPAC helped draft many of the current On-site Wastewater rules and its members were called upon throughout the 1990's to be instructors at On-site Sewage Conferences and Subsurface Operator Training Schools. Jon was recognized as inductee #7 to the North Carolina On-site Wastewater Hall of Fame in 1999.

11-3 Coastal Stormwater Rules and On-site Wastewater Systems

Charlie Humphrey
NC Cooperative Extension

The North Carolina Division of Water Quality reports that since 1990, over 1150 acres of coastal shellfish waters have been closed mostly because of high bacteria concentrations. Stormwater runoff generated by impervious surfaces such as roads, roof tops, driveways, and parking lots was considered the major culprit of delivering bacteria to the coastal waters. To reduce the impacts of stormwater runoff and improve water quality, the legislature implemented new, more stringent stormwater management regulations for the 20 coastal area management act (CAMA) counties in North Carolina. The new coastal stormwater rules went into effect October 2008. The new regulations require the use of stormwater best management practices (BMPs) to control the volume and quality of runoff from development projects that will contain more than 12 to 24% impervious surfaces, depending on proximity to shellfish waters. Like with on-site wastewater systems, the type of stormwater BMP used for a development depends on the soil and site conditions including depth to water table, soil texture and available area. Space for locating the house/structure, septic system and stormwater BMP will be even more limiting than before because coastal wetlands are not included in the total area calculation and the percent impervious surface thresholds for low and high density development has decreased. For some projects, developers may have to choose whether they want to use the best soils for the stormwater BMP site or for the septic system. Where individual homes or businesses use both on-site wastewater systems and stormwater BMPs, more planning, communication and educational efforts will be required to ensure that the wastewater and stormwater systems are designed, installed, and managed properly.

BRIEF BIOGRAPHY

Education
A.S. – Science, Craven Community College, New Bern, NC 1993
B.S. – Natural Resources, North Carolina State University, Raleigh, NC 1996
M.S. – Soil Science, North Carolina State University, Raleigh, NC 2002
PhD. – Coastal Resources Management, East Carolina University, Greenville, NC (in progress)

Work Experience

- North Carolina Cooperative Extension Area Environmental Agent- based in Craven County, NC (2002-present)
- Environmental Health Specialist- Wake County (2001-2002), Union County (1997-1999)
- NCSU Soil Science Research Technician- (1999-2001)
- City of Kinston, NC Planning Department- Forestry Intern (1996)

Licenses, Certifications, Etc.,

- NC Registered Sanitarian
- NC Licensed Soil Scientist
- NC Certified Subsurface Wastewater Operator
- Certified Technical Specialist, Nutrient Management
- Certificate of Training in Wetland Determination and Delineation

11-4 Shellfish Sanitation and Local Health Departments: A Collaborative Effort to Protect Shellfishing Waters

Andrew Haines
North Carolina Shellfish Sanitation and Recreational Water Quality Section

Shellfish are filter feeders, constantly pumping water across their gills in order to gather food particles. Through this pumping action, however, they also take up any bacteria, viruses, or other pollutants present in the water. These pollutants can concentrate rapidly within the gut of the shellfish, and can cause severe illnesses in humans should they consume the shellfish raw or undercooked. It is with this in mind that the North Carolina Shellfish Sanitation and Recreational Water Quality Section of the Division of Environmental Health monitors and classifies coastal shellfish growing waters.

One of the primary components of the Shellfish Sanitation program is the shoreline survey. The shoreline survey is a comprehensive review of all coastal land in order to identify potential or actual pollution sources that could impact a particular shellfish growing area. During the survey, field workers coordinate closely with local health departments to identify and repair failing septic systems, and also to identify structural deficiencies at package wastewater treatment plants along the coast. Through this collaboration, numerous significant sources of bacterial pollution have been eliminated from the shoreline surrounding shellfishing waters, and it is hopeful that continued collaboration will lead to further improvements in coastal water quality.

BRIEF BIOGRAPHY

Andrew was born and raised in Concord, Massachusetts, and then moved to South Bend, Indiana, where he attended the University of Notre Dame. There, he received a BS in Biology in 2002. He then attended Duke University, and received a Masters Degree in Environmental Management in 2004. Following his time at the Duke Marine Lab in Beaufort, he and his wife decided that coastal North Carolina was for them, and decided to stay in the area. Since that time he has worked with the North Carolina Shellfish Sanitation and Recreational Water Quality Section, first as a lab technician, and then as a shoreline surveyor. He received my RS in 2007, and currently, He is an Environmental Health Regional Specialist within the Shellfish Sanitation Section, where he coordinates the shoreline survey program and serve as a program liaison to other local, state, and federal agencies.

11-5 Human Bacterial Impacts in the North River Community

Lloyd Liwimbi, Alexandria Graves, David Lindbo, Bradford Robinson, Roland Coburn, Joie Lubbers, Daniel Vaal, and Charles Cahoon.
Soil Science Dept. , NC State University

The North River Community covers a stretch of 4 miles and is composed of 250 households within Carteret County, North Carolina. This community lies in the 100-year flood plain bordering shellfish sensitive waters and has struggled with maintaining septic systems in soils with high water tables that are not suitable for conventional wastewater treatment. Shellfishing waters near the North River Community have been closed as a result of elevated levels of fecal coliforms. A microbial source tracking study of the North River has been used to generate data on the potential inputs of fecal coliforms into the North River from septic systems in the North River Community.

BRIEF BIOGRAPHY

Lloyd Liwimbi is a second year graduate student in the Department of Soil Science at North Carolina State University. Lloyd is pursuing a MSc. with a research focus in the area of Soil and Environmental Microbiology. Originally from Lilongwe, Malawi, a country in southeast Africa, he earned his Diploma in Laboratory Technology and a BSc. in Environmental Science and Technology from the University of Malawi. He is employed by the State Department of Agriculture Research (Malawi) where he conducts soil fertility and microbiology research. His career goal is to return to his home town to continue his role as an Agricultural Research Scientist. His graduate studies will enable him to devise better ways to manage and utilize agricultural wastes as organic fertilizers and minimize pollution in surface waters.

11-6 Onslow County's Septic System Database, Repair, & Information Program (SSDRIP)

Diana Rashash
NC Cooperative Extension
Jon Harrison,
Onslow County Health Department

Onslow has implemented a septic system program, with CWMTF funding that consists of: a revolving loan and grant septic system repair program based on HUD income guidelines, a public education program, and a septic tank pump-out rebate program.

BRIEF BIOGRAPHY

Dr. Diana Rashash has been an Area Specialized Agent-Natural Resources for NC Cooperative Extension since 1996. As such, she deals with various water and wastewater issues. Diana is currently the NCCE designee to the NC Onsite Wastewater Contractors & Inspectors Certification Board.

Jon was a 1982 graduate of NCSU with a degree in Wildlife Biology. He began his Environmental Health career as a Sanitarian Intern in March 1984 and continues to serve Onslow County today as its Environmental Health Director. Jon was selected to be an original member of OSSPAC (On-Site Sewage Program Advisory Committee) in 1990. OSSPAC helped draft many of the current On-site Wastewater rules and its members were called upon throughout the 1990's to be instructors at On-site Sewage Conferences and Subsurface Operator Training Schools. Jon was recognized as inductee #7 to the North Carolina On-site Wastewater Hall of Fame in 1999.

12-1 Evaluating the Effects of Soil Type and Vertical Separation Distance on Septic System Wastewater Treatment and Groundwater Quality in Coastal NC

Charles Humphrey, Michael O'Driscoll, and Max Zarate
ECU, Geological Sciences and Environmental Health Services Branch, CDC/NCEH

For most on-site wastewater treatment systems, soil is the most important component for the removal and/or transformation of wastewater pollutants such as bacteria and nitrogen. Aerated soil between the trench bottom and water table provides the environment for pollutant reduction and helps protect shallow groundwater quality. North Carolina laws and rules for the design and installation of on-site wastewater treatment systems requires 12" to 18" of separation distance (suitable soil) from trench bottom to seasonal high water table for systems installed in groups II-IV, and group I soils, respectively. Many east coast states including Florida, Georgia and Maryland require 24" of separation for systems installed in all soils, while Massachusetts requires 60" separation for highly permeable soils (group I) and 48" for other soils. Given the role that aerated soil provides in wastewater treatment and the discrepancy between states on necessary vertical separation requirements, it is important to understand the affect separation distance has on pollutant removal, especially in areas with shallow groundwater tables.

A field based study was designed that included instrumenting 16 residential septic systems with networks of groundwater monitoring wells. For 8 of the sites, septic systems were installed in soil group I, 4 sites were soil group II and 4 sites were soil group III. Groundwater quality and groundwater levels adjacent to the systems were monitored for NO_3-N, NH_4-N, and *E.coli* concentrations and compared to background groundwater conditions and water quality standards for 15 months. For each system water quality during periods of high water tables (small vertical separation distance) was compared to the water quality during periods of low water tables (large vertical separation distances).

Geometric mean *E. coli* densities in groundwaters beneath systems for each soil group were higher during periods of shallow water tables and small vertical separation distances. For each soil group, the system with the smallest vertical separation distance was the least efficient at reducing bacteria concentrations before discharge into the shallow groundwater. Dissolved inorganic nitrogen (DIN) treatment efficiency was generally higher for systems that had the largest separation distance in all soil groups. However, for some systems DIN concentrations were higher during periods of deep water tables, possibly due to less dilution and more nitrification and leaching to the shallow groundwater system. It is recommended that systems installed in group I and II soils require a 0.6 m (24") vertical separation from trench bottom to the water table to reduce bacteria loadings and help increase the likelihood of nitrification and possible denitrification. The current 0.3 m (12") vertical separation distance for soil group III seems appropriate.

BRIEF BIOGRAPHY

Education
A.S. – Science, Craven Community College, New Bern, NC 1993
B.S. – Natural Resources, North Carolina State University, Raleigh, NC 1996

M.S. – Soil Science, North Carolina State University, Raleigh, NC 2002
PhD. – Coastal Resources Management, East Carolina University, Greenville, NC (in progress)

Work Experience

- North Carolina Cooperative Extension Area Environmental Agent- based in Craven County, NC (2002-present)
- Environmental Health Specialist- Wake County (2001-2002), Union County (1997-1999)
- NCSU Soil Science Research Technician- (1999-2001)
- City of Kinston, NC Planning Department- Forestry Intern (1996)

Licenses, Certifications, Etc.,

- NC Registered Sanitarian
- NC Licensed Soil Scientist
- NC Certified Subsurface Wastewater Operator
- Certified Technical Specialist, Nutrient Management
- Certificate of Training in Wetland Determination and Delineation

12-2 Fate and transport of nitrate and microbes as may occur under septic systems in areas with a high water table.

Sergio Abit
Soil Science Dept., NC State University

Nitrate (NO_3^-) and microbial contaminants are health and ecological threats and their fates in the vadose zone, capillary fringe (CF), and shallow groundwater (SGW) continuum impact their transport to ground and surface waters. The objectives of this study were to assess the effect of hydrology on NO_3^- fate in the CF and SGW and to evaluate the subsurface transport of indicator microorganisms under various hydrologic conditions. Nitrate fate evaluation was performed in 240-cm-wide, 60-cm-high, and 25-cm-thick flow cells. Two soils with different sand and organic matter contents were packed in separate flow cells. A solution containing 100 mg L^{-1} of both NO_3^- and bromide (Br^-) was passed horizontally through a simulated CF and SGW in the flow cells at various pore-water velocities. Nitrate and Br^- concentrations and redox potential were monitored at various locations in the CF and SGW. While reduced conditions developed in the SGW, parts of the CF remained aerobic. Nitrate and Br^- concentration in the CF remained comparable suggesting limited denitrification. However, reduced conditions in the SGW were accompanied by up to 100% loss of applied NO_3^-, while Br^- concentration remained high. Reduction in NO_3-N concentration was likely due to denitrification. To study microbial transport, a suspension of transformed *Escherichia coli* bacteria that fluoresce under ultraviolet light was applied at various rates to the top and side of a sand-packed 90- × 50- × 3-cm flow cell under various hydrologic conditions. One side of the flow cell was clear glass allowing visual observation of microbial transport under ultraviolet light. Time-lapse photos of microbial transport showed that *E. coli* were transported horizontally in the CF. The results imply that monitoring of subsurface transport of NO_3^- and microbes should include sampling the CF to prevent possible underestimation of the extent of their transport.

BRIEF BIOGRAPHY

B.S. Agriculture (major in Soil Science) -Visayas State University - Philippines

M.S. Soil Science (Soil Physics) - North Carolina State University

PhD Soil Science (Candidate - Soil Physics, minor: Hydrogeology) – North Carolina State University

Worked with Dr. Aziz Amoozegar and Dr. Michael Vepraskas for both MS and PhD Target date of completion: June 2009

12-3 CONSORTIUM OF INSTITUTES FOR DECENTRALIZED WASTEWATER TREATMENT (CIDWT) INSTALLER TRAINING PROGRAM

Nancy Deal, Bruce Lesikar, John Buchanan, Sara Christopherson, Kitt Farell-Poe, David Gustafson, David Kalen, David Lindbo, George Loomis, Rebecca Melton, Randy Miles
Soil Science Dept., NC State University, Texas A&M, Univ. of Tenn., Univ. of Minn., Univ. of Arizona-Yuma, Univ. of Minn., Univ. of RI, NC State University, Univ. of RI, Texas A&M, Univ. of Missouri

Training materials targeting installation and startup of onsite wastewater treatment systems have been developed by the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT). These materials describe the essential knowledge, skills, and abilities professionals who install onsite wastewater treatment systems should possess. The program promotes uniformity in practitioner training on installation practices and supports the credentialing of these professionals.

This curriculum development project was supported through the National Decentralized Water Resources Capacity Development Project (NDWRCDP). The funding for the project was provided by the US Environmental Protection Agency (USEPA) through the Water Environment Research Foundation (WERF).

The installer training materials were developed using a peer review process. The writing team for the materials consisted of professionals located across the country who have diverse experience with respect to technologies, soils, installation practices, and climatic conditions. An Official Installation Practitioner Review Committee (OIPRC) composed of members who have diverse knowledge of technologies, site conditions, and installation practices reviewed and commented on the materials as they were developed. A Project Review Group (PRG) provided oversight of the project and monitored progress. Broad, comprehensive review of the materials during the summer of 2008 helped refine the materials and captured broader industry input. Four pilot testing events refined the training program for completeness of concepts and clarity of delivery. The training manual will be available through Midwest Plan Service in July 2009.

BRIEF BIOGRAPHY

Ms. Deal is an Extension Associate with NC State University Soil Science Cooperative Extension and an adjunct lecturer with East Carolina University. She develops curricula and delivers training, education and technical assistance to homeowners, small communities, onsite professionals and local units of government regarding decentralized wastewater treatment. She has served as Project Manager and writer on numerous projects conducted by the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT). Ms. Deal is also engaged in research on system malfunction as related to best management practices (BMPs). She earned a BS from the Pennsylvania State University and an MS from NC State.

12-4 New Systems Update

Trish Angoli
OSWP

This talk provides an update to the I&E approvals over the past year, which new products have been approved and for what conditions, along with significant modifications to current approvals.

BRIEF BIOGRAPHY

Tricia Angoli has Bachelors and Masters degrees in Civil Engineering from West Virginia University. She worked for the National Small Flows Clearinghouse for ten years, for a private consulting firm that dealt with onsite and small community subsurface wastewater systems, and is currently with the On-Site Water Protection Section.

12-5 Performance of On-Site Wastewater Systems Sited on the Basis of Soil Evaluation

Bob Uebler, Kae Arrington and Steven Berkowitz
OSWP

Soil evaluation has been used in North Carolina for the siting of ground absorption sewage treatment systems since 1975, when the Commission for Health Services adopted the first technical guide for soil evaluation. Recently, the Commission has been asked to compare the performance of conventional gravel systems sited using soil evaluation to other products seeking their approval. Commission members found little available information on system performance upon which to make important decisions. The On-Site Water Protection Section initiated two efforts in 2005 to fill this information gap. First, a survey of 900 randomly selected conventional, chamber and polystyrene aggregate systems was conducted in 6 counties representing all three physiographic regions of the state. The survey revealed that only 3 percent of all the systems surveyed had a discharge of sewage to the ground surface. Second, a database was established from monthly reports of system installation and repair provided by county Health Departments to the state. Factors such as system type, age, and likely cause of system failure are recorded. This database is only 3 years old and more data is needed before any definitive statements can be made with regard to system performance, but reported repair rates in the database are less than 1% of installed systems at this point in time. Both the information from the survey and the data base indicate that systems sited on the basis of soil evaluation are performing remarkably well in North Carolina given the number of outside factors such as system use, and damage, which are beyond the control of the soil evaluator siting the system.

BRIEF BIOGRAPHY

Born: Buffalo, NY
BS: Physics, Canisius College, Buffalo, NY
Ph. D.: Soil Physics,Purdue University West Lafayette, IN
Licensed Soil Scientist
Regional Soil Specialist for 30 years with NC On-Site Section
Current chairmen of the NC Board for Licensing Soil Scientist
Has published 16 articles involving On-site Wastewater Disposal

12-6 Requirements for Soil Reports and System Designs

Ted Lyon, OSWP

The On-site Water Protection Section has prepared a guidance document for pertinent information that should be included in soil reports and waste waster system designs. The document was produced in response to the section receiving a number of soil reports and subsequent system designs for individual lots that do not provide adequate information. Guidance topics will include minimum soil evaluation requirements and minimum nitrification field design requirements.

BRIEF BIOGRAPHY

BS, MS. from NCSU
Mapped soil, Johnson County HD,
NCDENR Solid Waste,
NCDENR OSWP

13-1 Soil Treatment Area

Alan Clapp
Orange Co., HD

BRIEF BIOGRAPHY

Education

December 1986 Bachelor of Science in Biological and Agricultural Engineering, North Carolina State University, Raleigh, NC.

December 1995 Master of Science in Soil Science, North Carolina A & T State University, Greensboro, NC.

Licenses and Certifications

July 1990 North Carolina Registered Sanitarian #1118
April 1994 North Carolina Registry of Certified Professionals in Soils
January 1997 North Carolina Licensed Soil Scientist #1058

Positions Held

January 1987 - February 1988 Engineering Technician.

Soil and Materials Engineering, Greensboro, NC: Job responsibilities included testing concrete for strength, soils for bearing strength, and roofing materials for quality, construction, and installation.

March 1988- January 1997 Environmental Health Specialist.

Guilford County Health Department, Greensboro, NC: Job responsibilities included testing soils for suitability for a septic system, inspection of septic systems, inspection and testing of water supply wells.

February 1997- present Staff Soil Scientist.

Orange County Health Department, Hillsborough, NC: Job responsibilities include evaluating subdivision lots for on-site wastewater suitability. Conducting appeals and second opinions for environmental health staff. Conduct well and septic installation inspections.

13-2 Safety

David Lindbo
Soil Science Dept., NC State University

Every person on a job site is responsible not only for his or her own safety but also the safety of those around them. When safety is the most important goal on the site, everyone gets to come back to work the next day. Companies in the onsite/decentralized industry do not typically have an employee assigned specifically to oversee safety. That means that the supervisor or crew leader is often the competent person according to Occupational Safety and Health Administration (OSHA) standards. Workers should always feel free to express their safety concerns to the crew leader on the site at any time. When they do, the leader should stop, listen to the worker, and evaluate the potential safety issue that has been raised. Installers must identify critical issues, follow OSHA standards, and have a written safety plan that is followed by all. Under these conditions, an accident is an unforeseen incident that occurs while following established protocol instead of an incident resulting from an unsafe condition on the site.

BRIEF BIOGRAPHY

Since 1995 – Soil Extension Specialist, Soil Science Department NC State University
1994-1995 – Research Associate/Adjunct Assistant Professor, Univ. of Mass.
1991-1994 – Soil Scientist, USDA-ARS, Oxford, Mississippi
1990-1991 – Research Associate/Adjunct Assistant Professor, Univ. of Mass.
1988-1990 – Lab Manager, Howard Labs, Amherst, Mass.
1984-1990 – Graduate Student, Univ. of Mass.
1982-1984 – Graduate Student, Univ. of New Hampshire
1979-1982 – Student, Univ. of New Hampshire

1982 BS Environmental Conservation/Geology Option, Univ. of New Hampshire
1984 MS Soil Science, Univ. of New Hampshire
1990 MS Geology, Univ. of Mass.
1990 PhD Soil Science, Univ. of Mass.

13-3 Monitoring

Tim Crissman
OSWP

Performance monitoring is critical and may be required for renewal of operation permits for some systems. In this segment, specific requirements included in Rule .1970 are discussed, including parameters to be measured and timing of sample collection and procedures for flow monitoring. The segment also includes an overview of groundwater monitoring requirements as they relate to subsurface systems.

BRIEF BIOGRAPHY

Registered Sanitarian, Soil Scientist, Wilmington Regional Office, On-site Water Protection Section, Division Environmental Health, N.C. Dept. Environment and Natural Resources, November 2000 - present

Soil Scientist, Brunswick County Health Department, 1997 – 2000

Education:
B.S. Horticulture, N.C. A&T S.U., 1992
M.S. Plant and Soil Science, N.C. A&T S.U., 1996

13-4 Rules

Gene Young
OSWP

BRIEF BIOGRAPHY

Central Davidson High School 1970-1974

Davidson County Community College 1974-1976 AAS Degree in Soil and Water Conservation

NC A & T State University 1976-78 BS Degree in Soil Science

Davidson County Health Department 1984- June 1998
Registered Sanitarian since 1986
Davidson Counties first soil scientist in 1989
Licensed soil scientist in 1992

DENR-On-Site Wastewater Section July 1998-to present
Soil Scientist with Program Team July 1998-October 2001
Regional Soil Scientist October 2001-to present

Appointed by Governor Easley to NC Onsite Wastewater Contractor and Inspectors Board Oct 06
Board Chair January 2008 to present

NC Environmental Health State of Practice Committee-2002 to present

Married 29 years to Tonya

Member Clemmons First Baptist Church

Enjoy scuba diving and golf