WRC NEWSLETTER

VOL. 4 NO. 4 JULY, 1989

WATER RESOURCES CENTER, TEXAS TECH UNIVERSITY, LUBBOCK, TX 79409 (806) 742-3597

SAFE DRINKING WATER ACT SEMINAR AT TECH WELL ATTENDED

HDR Engineering, Inc., of Dallas, with the Water Resources Center and the High Plains Underground Water Conservation District No. 1 acting as co-hosts, presented a seminar on "Preparing for the Safe Drinking Water Act Amendments of 1986" on the Tech campus on May 19. A much larger than anticipated enrollment was accommodated by moving the meeting to the largest auditorium in Tech's Engineering College.

After a welcome by Dr. Lloyd V. Urban, Director of the WRC, and an introduction by William B. Hagood, Vice President of HDR Engineering, Inc., A. Wayne Wyatt, Manager of the HPUWCD, emphasized the importance of the act with particular emphasis on its bearing on the underground waters of the Texas High Plains. Gordon L. Culp, P.E., Executive Vice President of HDR Engineering, Inc., summarized the 1986 amendments to the 1974 Federal Safe Drinking Water Act pointing out that the number of regulated contaminants has increased from the 22 prior to 1986 by the addition of 83 more by 1989 -- and the end is not in sight. Congress has directed the EPA to add 25 additional contaminants to the list every 3 years with no limit on the number of additions. "This means that operators [of water treatment plants] are facing monitoring and reporting an ever increasing number of contaminants. Designers are faced with the task of designing facilities with a 10 to 20 year life without knowing which contaminants will be regulated only 3 years from now..."

Compounding the confusion, new verbiage in the law could generate litigation "for mental anguish caused by knowing that known carcinogens in 'harmful' (as defined by EPA) concentrations are present in their water supplies. In case you think the legal profession hasn't noticed this potential new market, the American Bar Association held a conference dedicated solely to these amendments..." Water designers and owners of drinking water systems may face potential exposure to liability.

After assessing the effects of the regulations on groundwater supplies, Culp summarized as follows: "While the rules for an exemption for disinfection of a groundwater supply are still a year away, it is reasonable to expect that a well documented case that the supply and distribution system are microbiologically safe will be essential. It is none too soon to make sure that the data you are collecting on your groundwater supply and distribution system presents a thorough, accurate picture of its microbiological quality."

Under the new law groundwater sources of potable water must be protected against contamination from injection wells. "The well head protection area includes the surface and subsurface surrounding a well or wellfield through which contaminants are reasonably likely to move toward a well."

Costs of compliance with the new drinking water rules will be heavy. In summary, Culp concluded that "Whether the costs of the programs dictated by Congress are justified by the benefits can be debated. What cannot is the fact that the drinking water industry will never be the same."

Thomas R. Caldwell, Vice President of HDR, spoke on "The Occurrence and Significance of Fluorides, Selenium, and TDS in Water." He described the methods for handling the problems they present and tabulated the costs to be anticipated in meeting them.

Tony Mollhagen, Director of the Environmental Sciences Laboratory at Tech, conducted a tour of his Water Quality Labs. This was followed by a lecture on "Sampling for Compliance" by Blair Leftwich, Director of the Lubbock Christian University Institute of Water Research. Linda B. Wyatt, Regional Director of the Texas Department of Health, discussed the "Regulatory Agency Status on Implementing the Safe Drinking Water Act."

W. Boyd London, Jr. and James R. Campbell, Vice Presidents of First

National Southwest Company presented "Financing Strategies for Water Utilities."

William B. Hagood, Vice President of HDR Engineering, Inc., Dallas, and holder of a BS in CE degree from Tech, presented "Alternatives and Solutions to comply with the Safe Drinking Water Act." He placed particular emphasis on some of the common compliance problems of the water supply systems in this region.

Testing for the 83 currently recognized contaminants must be commenced as soon as possible. Additionally, a monitoring program for currently unregulated volatile organic chemicals must be instituted within a year at facilities serving more than 10,000 persons and within two or four years for smaller systems.

Probable future regulations applicable to water systems on the High Plains were discussed in some detail.

"The disinfection requirement is probably the single most significant requirement contained in the new act which will immediately affect our area. In order to meet the requirements, disinfection facilities will need to be added at each water source to the system. For those of you who have multiple wells pumping into the distribution system, each well will need to be equipped with disinfection facilities."

"Disinfection with chlorine, chlorine dioxide or ozone to maintain a residual in the distribution system will create 'brown' water problems in the manganese-clad groundwater of our region. The development of this problem due to disinfection will, in most cases, require treatment to remove manganese prior to disinfection and distribution.

"Implementation of manganese treatment will necessitate complete restructuring of a community's water system..."

Wellhead protection to meet the requirements will be expensive.

The financing of the costly improvements demanded will be entirely the responsibility of the users without federal assistance.

Copies of a book, "New Water Treatment and Monitoring Regulations are Coming...Are You Prepared?" containing seminar speaker biographies, the papers presented by Wyatt and Gestes, Culp, Caldwell, London and Campbell, Hagood, and Wiley, plus two appendices "Safe Drinking Water Act Amendments...an Update" and "The Safe Drinking Water Act", were presented to the seminar attendees by HDR Engineering, Inc. Inquiries as to possible availability should be addressed to:

HDR Engineering
12700 Hillcrest Road, Suite 125
Dallas, Texas 75230-2096.

MOORE REPORTS ON LUBBOCK LAKESITE DEWATERING

Brian K. Moore added the degree of MS in CE to the BS and MS in Geology he had earned at Tech earlier by submitting a 111 - page report entitled "Dewatering the Lubbock Lake Landmark: A Design Example" as the final requirement for his Master's degree this spring semester. He was advised and guided in the successful endeavor by Dr. B.J. Claborn and Dr. Kenneth Rainwater of the WRC staff.

The lakesite is a state park and archaeological preserve covering approximately 300 acres of Yellowhouse Draw about three miles north of the Texas Tech campus. The water table at the site began rising in 1979, drowning archeological excavations and posing a health risk by attracting vectors to stagnant ponds.

The report describes site investigations, a computer modeling program to which Moore contributed significantly, an analysis of alternative means of water disposal, cost estimates for the lowering of the water table by 31 feet, conclusions, and recommendations.

The computer analysis is reproduced on pp. 62-111 of the report.

Moore is presently employed by Jones and Neuse, environmental engineers of Austin.

ZARTMAN AND RAMSEY RAINED OUT

R.E. Zartman and R.H. Ramsey have completed the fieldwork on their project of determining the bimodal water infiltration pattern in three playa lakes on the High Plains [WRC Newsletter, Nov. 1988] to within obtaining soil samples from the infiltration rings in one of the lakes for analysis. While collecting data during an evening at the site it began to rain. They are now awaiting the infiltration and evaporation of some ten feet of water.

Meanwhile laboratory analysis on the samples from the other two lakes is nearing completion and the project report with its accompanying thesis, technical journal reports, and presentations to lay user groups will be completed essentially on schedule.

BRASHEAR EVALUATES AERATED SOIL REACTOR

Land treatment of hazardous wastes has been used successfully in some situations and is lower in cost than the more usual methods. Large-scale projects of this nature have, however, been discouraged by the EPA because of

the impracticality of monitoring groundwater movement.

An alternative form of land treatment which would avoid the inadequacies commonly encountered was examined in an experimental investigation by Robert Brashear and reported in his thesis, "Evaluation of an Aerated Soil Reactor for the Degradation of Organic Hazardous Wastes" submitted for the degree of MS in CE granted in May.

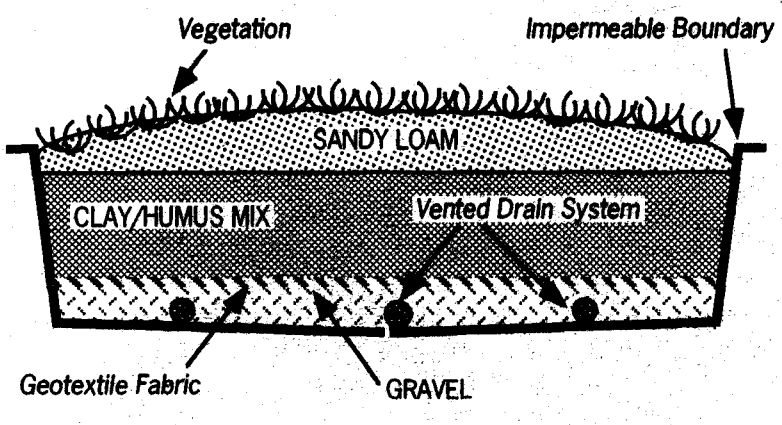
Rather than following the traditional pattern of applying wastes on the land surface at a low enough rate to "insure" that contaminants do not leach or migrate beyond the treatment zone and into the groundwater, he proposed to install an impermeable lower boundary and to aerate and collect the drainage just above this impermeable layer. The wastes were to have been degraded by microorganisms naturally present in the soil. The unique aspect of the proposed system is that leachate would be collected, monitored and could be recycled if additional treatment were to be required.

In his experimentation with a group of bench-scale reactors treating formaldehyde wastes he found that extensive aeration actually reduced the organic removal capacity and that apparently extensive aeration may not be necessary in the maintenance of aerobic conditions. The portion of chemical oxygen demand (COD) removed was at or above 90% for most of the reactors' lives. The non-aerated reactors were consistently higher in removal efficiency than their aerated counterparts.

"Regardless of removal efficiency, any and all leachate was captured and was available for diluting incoming wastes or for other treatment. So, unlike conventional land treatment, untreated wastes were not left in the environment and the fate of all wastes can be guaranteed. This is the tremendous advantage of soil reactors in dealing with hazardous wastes."

Brashear is currently pursuing his doctoral program in Civil Engineering at Tech.

Dr. Heyward Ramsey is the faculty advisor for Brashear's research.



Representation of a full-scale soil reactor illustrating the placement of an impermeable boundary around layers of soil.

WRC SOLICITS RESEARCH PROPOSALS

Funds have been made available to the WRC for conducting a limited number of investigations into problems involving the adequacy and quality of the domestic and agricultural water supplies of our region. These projects typically emphasize conservation, augmentation, and protection of the quality of available surface and groundwater supplies.

Faculty investigators are encouraged to utilize the funds to attract and support quality graduate and undergraduate students to participate in research.

It is anticipated that this program, like its predecessors in recent years, will support graduate students in research activities that will advance the efficiency of water use and reuse through contributions to groundwater recharge, groundwater quality protection, and water conservation generally. The theses cited in this issue of the WRC Newsletter indicate that such programs in past years have been most effective.

The following list of priority research topics, included in the call for proposals, expresses the current interests and concerns of the Water Resources Center.

I. Conservation of Existing Supplies
   - A. Agricultural Water Management Practices
   - B. Biotechnology and/or Plant Genetics
   - C. Municipal Water Management.
   - D. Drought Contingency Planning
   - E. Economic and Institutional Planning

II. Augmentation of Supplies
   A. Artificial Recharge (technologies, applications, well design, etc.)
   B. Enhanced Recovery from the Unsaturated Zone
   C. Stormwater Capture, Storage and Utilization
   D. Municipal Wastewater Reuse

III Protection of Existing Supplies
   A. Protection and Restoration of Groundwater Quality
   B. Underground Storage Tank (UST) Management
   C. Quality Impacts of Various Practices (e.g. irrigation, waste disposal, agricultural chemicals, oil production, etc.)
   D. Hazardous Waste Management

ZAMAN COMPLETES RESEARCH ON VOLATILIZATION FOR HYDROCARBON REMOVAL

Mohammed R. Zaman completed the requirements for his MS in CE degree in May by submitting a thesis entitled "Experimental and Theoretical Study of Volatilization for Hydrocarbon Removal in Unsaturated Porous Media." His thesis committee consisted of Dr. Kenneth A. Rainwater, Chairman; Dr. Billy J. Claborn; and Dr. Harry W. Parker.

The study on which the thesis was based consisted of an experimental and theoretical investigation of the process of removal of volatile organic contaminants from the subsurface. Two large soil columns, each 10 ft in height and 3 ft in diameter, were packed with a fine sand and provided with a central well through which air and vapors from a hydrocarbon mixture could be produced by use of a vacuum pump. Observed data on the removal of the hydrocarbon are presented in the thesis.

Two mathematical models were postulated in a search for a predictive formula which would reproduce the results obtained in the laboratory. The first model, based on vapor-liquid equilibrium relationships, predicted removal rates much higher than those observed. The second model, based on diffusion relationships, gave more realistic results. Not unexpectedly, however, it was verified that the presence of the porous medium and the residual water significantly retarded the diffusion of the hydrocarbons and slowed the removal process.

WRC
WATER RESOURCES CENTER
TEXAS TECH UNIVERSITY
P.O. BOX 4630
LUBBOCK, TX 79409