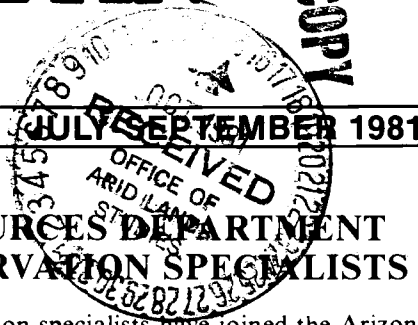


RIZONA WATER & RESOURCES NEWS BULLETIN

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DEEP PERCOLATION CONSIDERATION IN UNDERGROUND INJECTION CONTROL PROGRAM

The Arizona Department of Health Services (ADHS) is developing an Underground Injection Control (UIC) program to regulate the underground disposal of wastes via injection wells. The program will be initiated in February, 1982, after promulgation of the state UIC regulations.

Storm drainage wells, i.e., "dry" wells used to dispose of storm runoff for flood control purposes, are being closely examined by ADHS staff as a class of injection wells. These wells discharge runoff to the unsaturated zone above the water table. Hundreds of these drainage wells are located near water supply wells, mainly in the metropolitan Phoenix and Tucson areas. The presence of numerous contaminants is suspected in storm runoff that drains urban areas.

An inventory and assessment of these wells will be undertaken by ADHS to determine the wells' potential for polluting the state's underground sources of drinking water. The storm runoff assessment will include a literature review, as many studies on storm runoff quality have already been conducted: a Maricopa Association of Governments 208 Study, a Pima Association of Governments 208 Study, and several studies by the Water Resources Research Center at the University of Arizona.

Two key technical issues involved are determining which pollutants are found in urban runoff and whether attenuation of these pollutants takes place in the vadose zone. Regulations may require establishing policies for vadose zone attenuation for design purposes. If these wells are found to pose a pollution potential to the state's underground sources of drinking water, consideration will be given to incorporating construction, monitoring, and operating requirements for these wells into the state UIC regulations.

WATER RESOURCES DEPARTMENT ADDS CONSERVATION SPECIALISTS

Two water conservation specialists have joined the Arizona Department of Water Resources (DWR). Walter Parsons will assist with the agricultural water conservation plans, and Will LeGrande will develop the urban water conservation program. The 1980 Groundwater Management Act mandates effective water conservation practices by all groundwater users - mines, farmers, industry and city dwellers.

Walt Parsons, a Kentucky native, will help the DWR staff determine each farmer's "irrigation water duty." This is the per-acre amount of groundwater farmers will be allotted. The crops historically grown, soil conditions, and conservation methods being used in the state that would be reasonable for the farm unit will all be considered in the calculations. According to Parsons, the new law encourages farmers to be more efficient in their water use. "Many farmers already practice conservation, but much more can be done."

Mr. Parsons has had twenty-three years of experience with the U.S. Soil Conservation Service (SCS) in Arizona. For the past three years he specialized in farm irrigation programs in southern and southeastern Arizona. He is on loan to the DWR through an intergovernmental agreement with the S.C.S.

Will LeGrande must develop a way to reduce gradually the amount of groundwater withdrawn by non-irrigation users. Over a period of 45 years, divided into five management planning periods, the DWR will impose increasingly stringent requirements to meet the long-term goal of balancing the annual amount of water consumption and the renewable supply.

A native of Michigan, Mr. LeGrande has a Master's Degree in urban planning from Arizona State University. He spent the last two and one-half years as the waste-water flow-reduction and water conservation coordinator for the Maricopa Association of Governments' 208 Water Quality Management Program.



VADOSE ZONE ISSUE IN DEVELOPING GROUNDWATER QUALITY PROTECTION PROGRAM

The Arizona Department of Health Services (ADHS) is developing groundwater quality management objectives for the Salt River Valley and Upper Santa Cruz River groundwater basins. These objectives will be developed in two phases in consultation with the Department of Water Resources (DWR) and the regional Councils of Governments (COGs). In the first phase, the overall methodology will be established by the Arizona Water Quality Control Council. In the second phase, ADHS staff will prepare proposed objectives based on the methodology selected by the Council.

One of the key issues to be resolved is how to address pollutant attenuation in the vadose zone—what alterations in percolating water composition are expected to occur following a surface discharge in the unsaturated zone. Experts can only estimate because of limited knowledge and data on deep percolation. Nonetheless, regulatory agencies, such as ADHS, must make decisions on this issue to protect public health and prevent deterioration of the state's groundwater supplies.

Two options available in dealing with the vadose zone issue are: 1) ignore the vadose zone effects, and 2) address the vadose zone effects extensively on a technical basis. The first option is to assume a conservative public health position that the vadose zone has no effect on a waste discharge percolating to the groundwater, i.e., what is released on the surface is discharged directly into the groundwater. This is the simplest rule to implement administratively and would require the fewest regulatory agency resources. Surface discharges from ADHS regulated facilities would simply be required to meet the Council's groundwater quality protection objectives at the discharge point.

The second option is to assess the vadose zone effects on a technical basis. Regulatory agency staff would have to evaluate data related to pollution attenuation in the vadose zone, using discharge data, hydrology, geology and underground water quality data submitted by applicants proposing to construct an ADHS regulated facility that discharges to the vadose zone. This method is obviously more sophisticated technically but requires both applicant and regulatory agency resources to implement.

Both of these options are presented as starting points for debating this issue. Many other alternatives exist and comments from any interested party are requested. Please direct your comments to Marc Bennett, ADHS Water Quality Control, 1740 West Adams, Phoenix, Arizona 85007.

TUCSON AMA OFFICE MOVED

The Arizona Department of Water Resources Tucson Active Management Area (AMA) office has moved from 100 E. Alameda to 371 S. Meyer, south of the Community Center. The telephone number is 628-5858.

FLOOD THAT KILLS EIGHT PEOPLE JUST A SMALL ONE

The flash flood of July 26, 1981, in Tanque Verde Creek east of Tucson that killed eight people near Tanque Verde Falls was a small one for this stream. Records kept by the U.S. Geological Survey for Tanque Verde Creek since 1959 show that this flood, which had a peak discharge of 820 cubic feet per second (cfs), has been equaled or exceeded on an average of at least once every two years. Two larger floods, one about eight times as large, occurred within five days of the killer flood. However, the small flood struck when people happened to be in the stream and were unaware of the threat of flooding.

Flash floods are common in this area, especially during the "monsoon" season, and walls of water can travel for many miles at speeds faster than a person can run. Thus, flash floods can occur many miles from the storm area.

Records from the U.S. Geological Survey streamflow-gaging station one and one-half miles downstream from Tanque Verde Falls show that a flood peak of 5,000 cfs occurred early in the morning on the day before the killer flood. The records also show that an unusually large flood peak of 6,700 cfs passed the gaging station at 11:30 p.m. on July 30, 1981, five days after the killer flood. Even these larger floods were not rare events. The peak flow of 5,000 cfs may be expected to be equaled or exceeded once in 10 years and the peak flow of 6,700 cfs once in 17 years. Many flash floods such as the two larger floods on this stream are not noticed because they are short-lived and occur at night or early morning.

FIRST PHASE OF YUMA DESALTING PLANT EQUIPMENT CONTRACT COMPLETED

Hydranautics Water Systems of Santa Barbara, California has been given notice to proceed with furnishing basic desalting equipment for the Yuma Desalting Plant now under construction at Yuma, Arizona. This plant is the central feature of the Colorado River Basin Salinity Control Project, a federally sponsored project being constructed to meet treaty salinity limits on Colorado River water delivered to Mexico.

According to an announcement by the Department of the Interior's Bureau of Reclamation, the membrane desalination equipment being manufactured will have the capability of desalting 23.5 million gallons per day of irrigation return flows. Proof test results indicated that the equipment has the necessary mechanical integrity, but required additional capacity to assure design productivity during sustained operation on the Wellton-Mohawk drain water.

An agreement was reached between the contractor and the government whereby Hydranautics Water Systems will modify chemical cleaning solutions and provide increased membrane area, without additional plant construction or operating cost to the government. Test results indicate that these modifications can provide the required effective productivity.

LARGE VOLUME OF GROUNDWATER IN BLACK MESA AREA REPORTED

At least 180 million acre-feet of groundwater is present in the 5,400-square-mile Black Mesa area in the Navajo and Hopi Indian Reservations in Arizona, according to a recently released U.S. Geological Survey report. The water is contained in the N aquifer, which consists mainly of the Navajo Sandstone.

Before 1970, less than 400 acre-feet of water was pumped from the aquifer each year, according to the report. Since then, however, Peabody Coal Company has developed a coal mine and slurry pipeline on Black Mesa, and water use by Indian communities has increased. Pumpage increased to an average of 5,300 acre-feet per year from 1976-1979. As a result, water levels in wells that tap the aquifer declined at least 100 feet in an area of 200 square miles in the northern part of Black Mesa.

The groundwater report was prepared in cooperation with the Arizona Department of Water Resources and with assistance from the Navajo and Hopi Tribes and Peabody Coal Company. It includes maps showing recent water-level changes in the N aquifer and maps showing probable future changes.

According to J.H. Eychaner, author of the report and a hydrologist at the U.S. Geological Survey office in Tucson, Arizona, "The water level at Kayenta declined 50 feet by the end of 1979. Water use by the people living at Kayenta caused most of the decline, but about 7 feet was due to water use by the mine and pipeline on Black Mesa.

"At Oraibi, the water level fell 16 feet, of which 13 was caused by pumping near the coal mine. At Tuba City the decline is about 10 feet, all of which is due to water use by the community."

The report notes that pumping water from the Navajo Sandstone does not affect water levels in the many wells on Black Mesa that draw water from other aquifers. These overlying water-bearing layers are isolated from the N aquifer by 200 to 1,000 feet of low-permeability rocks.

The author states that water use by towns and schools is increasing in the Black Mesa area, and that by 1990 community supplies may use more water from the Navajo Sandstone than will be needed at the coal mine. Any water pumped from the N aquifer near Black Mesa contributes to regional water-level declines.

By 2001, water levels in wells that tap the Navajo Sandstone probably will have declined more than 100 feet in an area of 440 square miles near the coal mine, according to the report. Water levels probably will drop less than 5 feet in most wells more than 10 miles from Black Mesa. The author says that wells will not need to be deepened because of these declines, but that pump intakes may need to be lowered in a few wells on Black Mesa.

The report, *Geohydrology and effects of water use in the Black Mesa area, Navajo and Hopi Indian Reservations, Arizona*, U.S. Geological Survey Open-File Report 81-911, was prepared by J.H. Eychaner. Copies are available for inspection at U.S. Geological Survey offices: Room 5-A Federal Building, 301 West Congress Street, Tucson; Suite 1880, Valley Center, Phoenix; 2255 North Gemini Drive, Building 3, Flagstaff; and Room 312 National Center, 12201 Sunrise Valley Drive, Reston, Virginia. The report may be purchased from the U.S. Geological Survey, Open-File Services Section, Branch of Distribution, Box 25425, Federal Center, Denver, Colorado 80225. The price is \$7.00 for a paper copy, and \$3.50 for a microfiche.

SHORT COURSE

A short course on **WATER QUALITY MODELING** will be held in Las Vegas, Nevada, January 11-15, 1982. The objectives of this course are to define the need and justification for water quality criteria, to establish the constraints imposed by current regulations, to present the fundamentals of modeling techniques and to demonstrate their applicability to the rational solution of water quality management. The course is designed to aid managers, technicians, regulatory personnel and others who are intimately involved in the decision making process regarding water quality control. Upon completion of the course, participants will understand the principles of modeling techniques, their limitations and their application to chemical, biological and physical processes. Principal lecturers will include: W.W. Eckenfelder, P.J. St. John, G.F. Lee, G.T. Orlob, K.L. Dickson, and P.A. Krenkel. For further information contact P.A. Krenkel, Executive Director, Water Resources Center, Desert Research Institute, P.O. Box 60220, Reno, NV 89506; phone (702) 673-7361. (Continuing education credits will be awarded, if desired.)

CONFERENCES

A conference on *Water for Western Energy Development* will be conducted by The Energy Bureau, Inc. October 5-6 in Denver, Colorado. For additional information call Jared Smith, vice president, The Energy Bureau, 212-687-3177.

A conference on *Waste Impact on Water* and a Symposium on *Unified River Basin Management - Stage II* will be held October 4-8 in Atlanta, Georgia, by the American Water Resources Association (AWRA). Contact AWRA, St. Anthony Falls Hydraulic Laboratory, Mississippi River at 3rd Ave., S.E., Minneapolis, Minnesota 55414. Telephone 612-376-5050.

PUBLICATIONS

A Home Buyer's Guide to Flood and Erosion Hazards is a two-page brochure published by the Southwest Environmental Service to help potential home buyers determine whether a property is flood prone. Flood insurance information is also provided. Copies can be obtained by writing to the Southwest Environmental Service, P.O. Box 2231, Tucson, AZ 85702 or by calling Jane at 624-2353.

Satellite Hydrology, edited by M. Deutsch, D.R. Wiesnet, and A. Rango and published by the American Water Resources Association, is the proceedings of the Fifth William T. Pecora Memorial Symposium on Remote Sensing held at the EROS Data Center, Sioux Falls, South Dakota, June 10-15, 1979. The 730-page color illustrated book includes an overview section and chapters on satellite data applied to meteorology, snow and ice, surface water, soil moisture, water quality and environment, groundwater, wetlands, coastal zone, hydro data delay, and water use and management. Price before October 15, 1981: \$65.00. After October 15: \$85.00.

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PUBLICATIONS (continued from page 3)

Groundwater Hydrology, 2nd Edition by David Keith Todd is a revised and greatly expanded groundwater text that presents the fundamentals, principles, methods and problems encountered in this field at a readily understandable level.

Among the many topics covered are a new chapter on groundwater pollution; a comprehensive introduction to well drilling methods; a simplified exposition of the hydraulics of wells; the practical problems of artificial recharge and seawater intrusion; a definitive approach to all kinds of groundwater fluctuations; and much more. All units have been converted to the SI system.

The 535-page hardbound book, published by John Wiley & Sons, Inc. in 1980, contains 276 figures and 53 tables. It is priced at \$28.95.

Drainage of Agricultural Land was published in 1973 by officials of the Soil Conservation Service, U.S. Department of Agriculture Water Information Center. The book was designed to serve primarily as a practical working handbook for the design, construction and maintenance of drainage systems. Mathematical concepts are expressed in graphical form for easy application. The 423-page volume is priced at \$18.00.

Stormwater Management Alternatives, edited by J. Toby Tourbier and Richard Westmacott, is the proceedings of the National Conference on Stormwater Management Alternatives,

held October 3-5, 1979, in Wilmington, Delaware. Topics include structural and non-structural controls, best management practices, design for multipurpose uses, fundability and institutional arrangements, and public information/participation and local support. The volume is available from the Water Resources Center, University of Delaware, 42 E. Delaware Avenue, Newark, Delaware 19711 for \$15.00. Prepayment is required.

Please address your news items or comments on the Project Bulletin to any of the editors:

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