

Minnesota Ground Water Association

Volume 9, Number 3: October, 1990

A Lesson to be Learned

By Jerry Rick, Past President of MGWA

The following is a recent article published in "Hazardous Waste Business" (August 15, 1990). I would like you to read the story and then I would like to present a few of my opinions regarding this unfortunate situation.

A scientist with the Tampa, Florida office of Geraghty & Miller, Inc. Environmental Services has been arrested by the FBI and charged with accepting a \$30,000 kickback on a Superfund project, according to Peter Palmer, regional vice president with Geraghty & Miller in Tampa.

Palmer says an individual at Geraghty & Miller, who was not identified, was contacted by officials from Envirotech Drilling Company of Wiggings, Mississippi. These officials, according to Palmer, informed Geraghty & Miller of efforts by the scientist to obtain a cash payment of \$30,000 in order to be considered for a contract.

Palmer said Geraghty & Miller's corporate attorney, Jim Miller of Dublin, Ohio, "was contacted according to the terms of our contract." Miller notified authorities, which ultimately led to the scientist's arrest. The FBI reports that the scientist told Envirotech that the company's bid of \$145,000 would have to be inflated to \$175,000 and that the difference of \$30,000 should be paid to him. The bid was in

connection with a job at Homestead Air Force Base near Miami.

Geraghty & Miller have a contract with the U.S. Environmental Protection Agency to test groundwater at military bases.

FBI agents taped the scientist's conversations with the Mississippi company and arrested the scientist at a Burger King in Tampa, after he allegedly accepted the \$30,000. The scientist is free on \$50,000 bail. If convicted, he faces a possible 10-year prison term and a fine of up to \$1 million.

Palmer says the scientist had been with the company for four years and had recently been placed in charge of a portion of the \$20 million Superfund contract.

In my opinion, this is a "bad news-good news" story. The bad news is that the actions of the scientist damaged not only his reputation, but also could have impacted the reputation of a respected company and the entire industry. Although he individually, if convicted, faces severe penalties, he has already damaged the reputation of his co-workers, his company, and the entire industry.

However, there is some good news in this story.

First, Envirotech responded properly by contacting Geraghty & Miller to inform them of the attempted kickback rather than going along with the illegal and unethical activity. There would have been no immediate financial penalty for Envirotech to simply participate. They would have received their original \$145,000 bid. What would you have done?

Second, Geraghty & Miller responded properly by not trying to cover up the kickback. Rather, they notified the authorities even though they had to have known the negative publicity that this situation would generate.

They could have simply tried to cover it up internally. Geraghty & Miller, in my opinion, responded ethically as well as legally to this situation. Imagine you were the individual in Geraghty & Miller contacted by the driller -- what would you have done?

And finally, the scientist got caught. The system worked. This is good news.

Jerry Rick is the President of Delta Environmental Consultants, Inc.

1991 Election

President-Elect and Treasurer to be chosen

Election Ballot on Page 8

Vote Now !

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On Being One of The Heardtm

By Doug Ewald

Communicating With Legislators

The most frequently asked question about legislators regards communicating with them - so here is a summary of sound communication suggestions.

Of course, all communication is easier if the party you're contacting knows who you are and knows something about your concerns.

The easiest way to establish that base line knowledge is to write an initial letter to the state senator and representative who represent the district in which you live. Be formal or informal - conversational is best.

Tell them simply who you are, where you live, what you do for a living, what your major issues are and your concerns. Offer to serve as a resource to them if they need information - and all legislators do. Suggest a brief meeting in which you can get to know each other better and begin a working relationship. With that as a base, here are some suggestions:

If you want to know who your legislators are, call the House Information Office (612) 296-2146 and Senate Information Office (612) 296-0504. Give them your home address and they'll tell you who your legislators are, and give you the address where they want to receive mail.

When writing, identify yourself by way of a return address on the envelope - constituent mail gets read.

To write or type? Little difference here, but neat and easy to read. Write on only one issue per letter if at all possible and identify it (including bill numbers if you have them) at the beginning of the letter. Try to limit your letters to one page, even if you have to eliminate a lot of detail; they'll know how to reach you if they need more information.

Selling an idea to a legislator is like any other selling - remember this and you'll avoid a lot of common mistakes that can screw-up the sale such as:

- Spelling their names wrong.
- Getting their offices wrong (state senators and representatives are not congressmen).
- Calling them names.
- Threatening them.
- Demanding they see things your way.
- Use of form letters - a total waste of time.

Want to communicate effectively with legislators? Put yourself in their place...

(Reprinted from *Well Advised, Newsletter of the Minnesota Water Well Association*, August-September 1990; Doug Ewald is Executive Director of MWWA)

Monitoring Wells

Call

Thein Well

1-800-992-8832

METRO:

(612)-464-1177

Minnesota Water Plan

The Water Resources Committee (WRC) of the Minnesota Environmental Quality Board (EQB) recently released a review draft of the Minnesota Water Plan (MWP) for public comment. The plan was mandated by the 1989 State Legislature and will guide water planning and management activities in Minnesota for the next five years. The MWP identifies 28 issues and objectives for the coming decade and groups them into 7 policy categories:

- managing the use of air, land, and water;
- communication and education;
- water supply protection;
- infrastructure;
- information, monitoring, and assessment;
- reduction of environmental pollutants; and
- overall issues.

The WRC and its staff have worked on the draft plan since fall 1989. It stresses two underlying principles:

- The concept of inter-connections between water quantity and water quality issues and between surface waters and ground waters; and
- Helping to foster partnerships among local, state, and federal agencies, the academic community, private sector and non-profit organizations to address these inter-connections.

The MWP makes a wide range of specific proposals on such issues as drought planning, water emergency plans, wellhead and aquifer protection, water education efforts, needs for improved monitoring networks, research on improved methods of water treatment and agricultural practices that avoid water quality degradation.

Persons interested in receiving a copy of the 101 page MWP review draft or making comments on the plan may contact the EQB - WRC at 300 Centennial Building, 658 Cedar St., St. Paul, MN 55155. The final version of the plan is due November 15, 1990.

(Reprinted from *Minne Gram*, Water Resources Research Center, University of Minnesota, September 1990)

Dewatering Impact Studied for I-394 Construction

By Richard Johnson and Laura Myers-Wittman

Those of you who drive the Minnesota Highway 12/Interstate 394 corridor west of Highway 100 know that a lot of real estate has been removed from the area between Turners Crossroads and Florida Avenue. But did you know that, when completed, the section that passes beneath the railroad will be 8 feet below the regional ground water table?

Thanks to the Minnesota Department of Transportation (Mn/DOT) and Braun geotechnical engineers and hydrogeologists, however, you'll still be high and dry (or should we say low and dry). That's because a series of parallel drains running beneath the road will keep the ground water near the right-of-way at least 5 feet beneath the road surface.

Because the railroad crossing could not be eliminated and interstate construction standards far exceed those which existed when Highway 12 was built, the new roadbed had to be lowered considerably. Mn/DOT retained Braun to conduct an aquifer performance test to determine the aquifer characteristics used to design the drain system and evaluate the short-term effects of the permanent dewatering system.

To help Mn/DOT maintain its design and construction schedule in order to obtain \$26 million in Federal Highway Administration funding, we had to complete the project in six weeks.

First Step - Aquifer Performance Test

Our initial step was to design and conduct an aquifer test. A large-diameter well was installed along the corridor in a location suitable for construction dewatering. Ten piezometers were installed for monitoring water table drawdown during the aquifer performance test in addition to the 12 that Mn/DOT had previously installed.

Drawdown was measured in the wells using a pressure transducer/data logger network that automatically recorded water levels in eight of the wells on a predetermined time schedule. Water levels in the other piezometers in the Turners Crossroads area were measured manually. A constant rate of pumping test was conducted for 72 hours and followed by a 72 hour recovery test.

Prior to conducting the pumping test, the ground water in the vicinity of the pumping well was determined to be contaminated, and approvals for discharging potentially contaminated ground water were obtained from the Minnesota Pollution Control Agency and local officials.

Evaluating Soil Subsidence

In addition to determining aquifer characteristics, the potential for soil subsidence during dewatering was also analyzed because the corridor is lined with office buildings and light manufacturing facilities. Steel rods were placed in the ground at various locations surrounding the test area. The elevations of these rods were measured before and after pumping to evaluate soil subsidence.

Computer Model to Simulate Field Conditions

The pump test data were analyzed, and aquifer parameters such as hydraulic conductivity, storativity, and transmissivity were determined. These parameters were used in calibrating a ground water computer model to simulate field conditions encountered during the aquifer test. Once calibrated, the model was used to evaluate the impact of construction and permanent dewatering on the surrounding business sites.

Results from the computer modeling were used to delineate areas where soil settling might occur during dewatering. Modeling results also showed that two areas with ground water contamination would be impacted by dewatering. Using this information, we designed a remedial action plan for Mn/DOT that would enable them to remediate the sites in conjunction with their con-

struction dewatering activities.

Remedial action included excavation and stockpiling of contaminated soils in conjunction with roadbed construction and pumping and treatment of contaminated ground water by carbon absorption and aeration.

Under Budget and On Time

Due to Braun's and Mn/DOT's well managed and coordinated team effort, the project was completed under budget and within the necessary time. Several weeks of around-the-clock work were required to install the wells, perform and analyze the aquifer test and prepare the summary report. The Federal Highway Administration funding was subsequently obtained and, as many of you know, construction is well underway in the Turners Crossroads area.

On February 3, 1990, the Consulting and Engineering Council of Minnesota (CEC/MN) presented Braun with a Grand Award for Engineering Excellence for designing and conducting the I-394 dewatering study.

Richard Johnson served as project manager for the I-394 study.

Laura Myers-Wittman served as hydrologist and principal author of the I-394 study.

(Reprinted from *Braun Testing Report*, August 1990)

Editors note: According to Gary Thompson, Mn/DOT, I-394 Corridor Manager, up to five homes in the Turners Crossroads area may have been affected by the dewatering and drainage systems. Maximum subsidence, currently measured at about 3/4 inch, may have been reached this year. A claims process has been established for property owners who may have been damaged by the project. Nancy Radle, Mn/DOT, Technical Services Division, says the combined dewatering and cleanup worked well; it was efficient, cost-effective and avoided major delays in construction. She also said that the active cleanup phase went on as long as construction allowed and that current monitoring may lead to additional remediation in the future.

The Anoka Sand Plain Study

The Anoka sand plain is the subject of the first Minnesota Geological Survey regional ground-water assessment since the adoption of the Minnesota Ground Water Protection Act of 1989. Anoka, Chisago, Isanti, and Sherburne Counties comprise most of the area of the sand plain, which is unusually sensitive to ground-water contamination because of the high permeability of its surficial sediments and

the rapid pace of development in the region.

With the assistance of staff from local soil and water conservation districts, the Survey is developing a computerized subsurface data base for the counties included in the study area. Maps are being compiled and digitized to show surficial geology, hydrogeology, and sensitivity of near-surface ground water to contamination from sources at the land surface.

This is the second year of a two year project. Carrie Patterson is mapping the surficial geology from soil surveys and air photos, and

preliminary surficial maps for Anoka and Sherburne Counties are complete. Roman Kanivetsky has compiled preliminary water-table maps for Anoka and Chisago Counties. Other Survey staff are involved with data collection and mapping. Gary Meyer coordinates the Survey's activities.

The project is funded by the Groundwater Protection Act and administered by the Minnesota Department of Natural Resources, Division of Waters.

(reprinted from the Minnesota Geological Survey Newsletter)

Nitrate Awareness: A Health Issue

Nitrate is an effective fertilizer which provides an essential plant nutrient to crops, lawns and other vegetation. Overuse or improper use of nitrogen can eventually lead to nitrate contamination of nearby wells.

While this is not surprising with shallow wells, deep wells are frequently affected, particularly if they were dug subsequent to a first well. An Iowa State University Special Report found that old or depleted wells, often just abandoned and not filled with concrete (as is required in Minnesota), become readily available reservoirs for runoff and excess soil water. Repeated influx of surface water, carrying fertilizers and herbicides, to the old well allows these compounds to leach into the ground water.

A subsequent Penn State study reports that housing developments built on farm fields that had been cultivated for generations are particularly susceptible to high nitrate levels.

When certain nitrates are ingested through drinking water, the digestive process will chemically convert them to nitrites. Once these nitrites enter the circulatory system, they combine with the blood's hemoglobin. Hemoglobin is the part of the red blood cell which picks up oxygen and distributes it to the body's cells. However, when nitrites are present, the hemoglobin retains the oxygen. The affected person's general health may suffer as the concentrations increase. Shortness of breath, susceptibility to illness, heart attack, or even death by asphyxiation can result.

Once nitrate is detected in well water, point-of-use water treatment generally is required. For acceptable levels of nitrate in drinking and cooking water, the reverse osmosis and distillation processes are widely used.

Another method of treating nitrate contamination is with a system much like a water softener but which contains a strong base anion exchange resin instead of cation resin. The system is regenerated in much the same way as a water softener.

Some communities have tried controlling high nitrate levels in their central water systems by using a "split-stream" arrangement. In this system, a portion of water is drawn off, and treated using an anionic nitrate removal process. The treated water is then blended in to the untreated water to dilute the nitrate concentrations. While this is effective in lowering the concentrations, a point-of-use system is suggested for consumers who want to control nitrate levels in their home water system.

For the users of the more than 14 million private wells in this country, point-of-use may provide the only solution for their nitrate contamination.

Well owners should test their well water regularly as a matter of course. It's a simple step to insure your family's health.

(reprinted from *Water Review*, Consumer Report, Vol. 3, No. 2.)

AGI's Minority Scholarships Triple

The American Geological Institute has had a significant increase in funds available for minority geoscience scholarships to be awarded for the 1990-1991 academic year. Also, the number of scholarships has almost tripled from a total of 36 given in the 1989-1990 academic year to 80 available for 1990-1991. The value of awards, to be given to Black, Hispanic, and Native American undergraduate and graduate students, will total \$221,000. The total value of awards given in 1989-1990 was \$36,750.

The increase is due largely to a grant from the National Science Foundation. The scholarships, sponsored by the AGI Minority Participation Program, are intended to encourage underrepresented minorities to pursue careers in the geoscience profession.

The NSF grant will be based on the merit and the availability of funds. Geoscience professional societies and industries, and individuals, also contribute funds.

The deadline for all application materials is Feb. 1, 1991. For more information on the AGI-MPP Scholarships and related programs, contact Marilyn Suiter, Director, AGI Minority Participation Program, 4220 King street, Alexandria, VA 22302, (703) 379-2480.

(Reprinted from *The Professional Geologist*, September, 1990)

Ground Water Fauna Important to System

Ecologists working on the Flathead River in western Montana have concluded that the health of the River is dependant on the fauna of the ground water system.

The ground water of Flathead is inhabited by scores of previously undetected species of insects, crustaceans, worms, and other invertebrates. Some of the ground water organisms migrate from the aquifer to the river directly, helping to support the riverine ecosystem. Others remain in the aquifer, supporting that ecosystem.

Most of the nutrients transported to the river move as dissolved chemicals released from the ground water ecosystem. In addition to the larger organisms, the scientists have found an abundance of algae, bacteria, fungi, and protozoa.

The mixing of the ground water and river water and the flow of nutrients is made easier by the porosity of the glacially deposited deep gravel. While European scientists have described organisms found beneath gravel-bedded rivers, there have been no previous reports of such an abundance and variety.

There's a far greater interdependence between riverwater ecosystems and ground water than previously believed, according to James Ward, professor of Biology at Colorado State University in Fort Collins.

Ward and Jack Stanford, who directs the University of Montana Biological Station at Flathead Lake, base their conclusions on repeated sampling of wells along the floodplain of the Flathead River.

Stanford and Ward first published their findings in 1988 in *Nature*. For additional information, write to J.V. Ward, Department of Biology, Colorado State University, Fort Collins, Colorado 80523.

(Exerpts from *Ground Water*, Vol 28, No 1, and *Water Well Journal*, October 1990)

October, 1990

Comprehensive National Water Use Report Available from USGS

A comprehensive report on water use in the United States has been released by the U.S. Geological Survey. The data are presented through the use of hundreds of maps and tables.

Some tidbits from the report:

- Water use in the United States, which currently averages about 338 billion gallons per day (gpd), has more than doubled in the last 35 years and is expected to continue to increase. At the same time, water contamination will continue to be a major concern limiting the availability of adequate supplies of quality water.
- The population served by public-supply systems increased 33 percent between 1960 and 1985 and during the same period withdrawals increased 78 percent. Per capita use increased from 90 gallons per day to 117 gallons per day.
- Agricultural use represented the largest uses (42 percent) of the total freshwater withdrawals. Ninety seven percent of the withdrawals were used for irrigation.
- Surface water was used as drinking water by 47 percent of the population. Ground water was used as drinking water by 53 percent of the population.

Much of the report is devoted to state summaries that describe for each state, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands the available water supplies, the history of water resources development, discernible trends in water uses, water management approaches to the allocation of water to various uses, and a comparison of the quantity of water that is consumed and the quantity that is returned to the ground water or stream system for reuse.

Each state section contains three maps that show by county the fresh surface water, ground water, and total (combined surface and ground water) withdrawals, and state maps that show surface water

withdrawals by principle river basin and ground water withdrawals by principle aquifer. The river-basin and aquifer maps also show the distribution of the withdrawals among the five categories of use.

In addition to the maps, each state section also provides total estimates of surface and ground water withdrawals, total usage among the five categories of use, the quantity of water consumed, and the amount of water returned to the ground water or stream system.

Copies of the 553-page report, titled *National Water Summary 1987 - Hydrologic Events and Water Supply and Use* and published as USGS Water-Supply Paper 2350, are available for \$31 from the U.S. Geologic Survey, Books and Open-File Reports section, Federal Center, Bldg. 810, Box 25425, Denver, CO 80225-0425, (303) 236-7476. Checks and money orders should be payable to the "U.S. Department of the Interior-USGS."

(reprinted from a U.S.G.S. News Release)

We Need Your News!

Newsletters don't magically appear out of the blue. Four times a year we review a variety of sources: other newsletters, magazines and journals, brochures and flyers, etc. But our best source is you!

Are you working on something new?

Using innovative technology? Solved a really nasty (therefore interesting) problem?

Been to a terrific conference of interest to you (and other members of MGWA)?

Write to us! Tell us! You (probably) won't regret it! Send your news to:

Jan Falteisk
Editor, MGWA Newsletter
DNR - Division of Waters
500 Lafayette Road
St. Paul, MN 55155-4032

Contaminated Ground Water Common at AOC's

Although Areas Of Concern (AOCs) are first and foremost surface water quality problems in the Great Lakes system, Remedial Action Plan (RAP) teams are also wrestling with another pervasive environmental problem: contaminated ground water.

In Toronto, for example, an environmental audit of port industrial lands on the eastern shores of Toronto Harbour documented eleven different spots where ground water is contaminated. Originally a marsh, the area was filled and devoted to petroleum refineries, chemical and coal storage facilities, metalworks, and docks. The problems are mostly volatile organic chemicals, and polyaromatic hydrocarbons (PAHs). The most common sources of ground water problems are hazardous waste

sites, improperly designed or maintained landfills, and pesticides from agricultural runoff.

In the immediate vicinity of the Niagara River are dozens of hazardous waste dumpsites, some of them suspected of leaching toxic substances such as dioxin into ground water. Ground water near the Sheboygan River and harbor in Wisconsin has been contaminated by leachate from a landfill, while hazardous waste sites near the Clinton River in Michigan are contaminating ground water there.

Ground water contamination and its relationship to the Lakes has not been well researched. Ground water data is spotty, and hard to get. Some major studies recently completed or underway, such as the joint Canada-U.S. Upper Great Lakes Connecting Channels Study, have attempted to assess contamination of open waters from ground water.

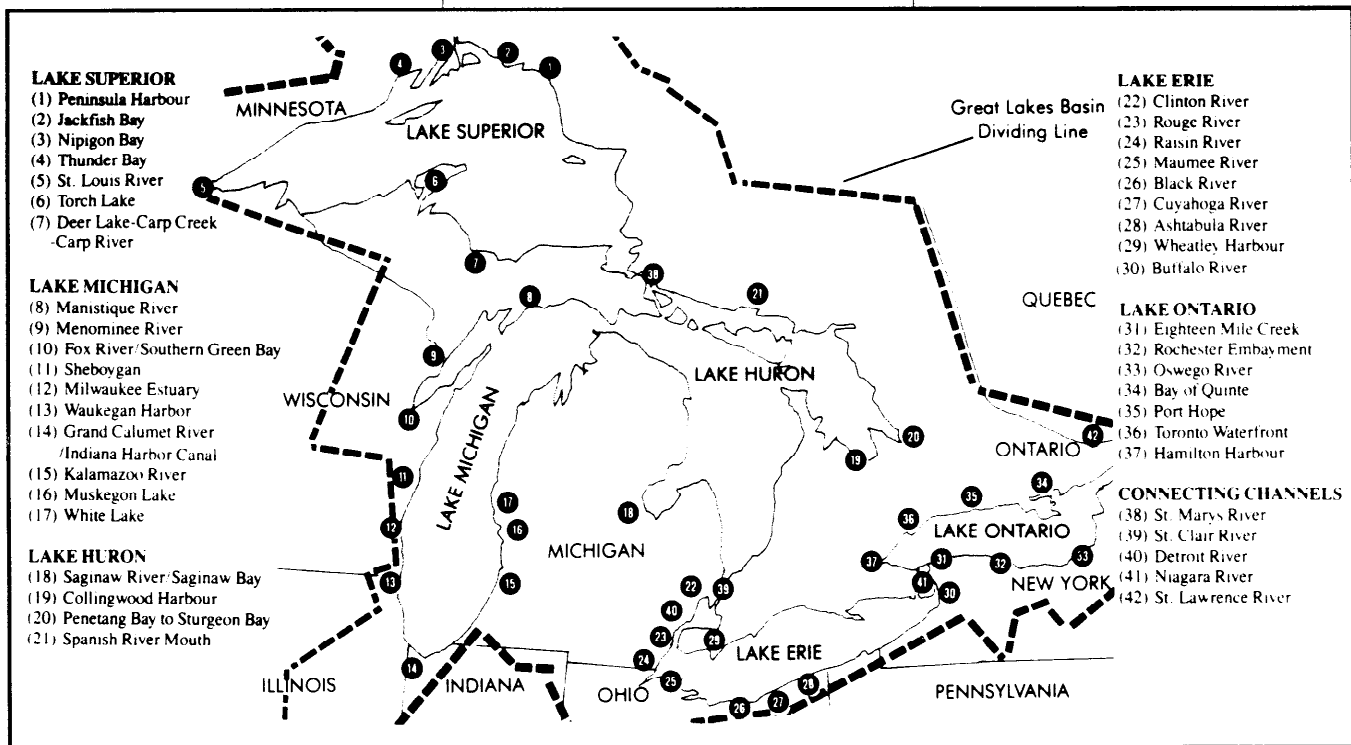
A joint project by the Canada Centre for Inland Waters and the U.S. Geological Survey is attempt-

ing to create a three dimensional ground water flow model for a 70-square mile (171-square kilometer) area on both sides of the Niagara River. The project, begun in 1987, has involved continuous monitoring wells, and a study of the geology of the area.

One site where ground water clearly contributed to surface water problems is at White Lake. Contamination from disposal lagoons at a chemical plant was found in the late 1970's to be fouling both local ground water and the nearby lake. The local aquifer is heavily contaminated with C56, a heavy hydrocarbon.

Under a consent decree, "purge wells" were installed between the site and White Lake, to intercept the contaminated water as it moved through aquifers to the lake. The ground water is treated and then pumped into the lake.

(Reprinted from *The Great Lakes Reporter*, July/August 1990)



The Center for the Great Lakes has completed and made available to the public Fact Sheets on each of the 42 Great Lake Areas of Concern (AOCs). These include a description and history of each AOC, and information on the Remedial Action Plan process. In addition, the center has prepared Fact Sheets on two broad problems affecting many of the AOCs: contaminated sediments and heavy metals. The Fact Sheets are available free of charge, and are updated regularly. To request copies, write or call the Information Service at The Center for the Great Lakes, 435 N. Michigan Avenue, Suite 1408, Chicago, IL 60611 (312-645-0901), or at The Center for the Great Lakes, 320 Bloor St. West, Suite 301, Toronto, ON M5S 1W5 (416-921-7662)

Well Disclosure Information

A new state law effective July 1, 1990, requires that people who buy real estate in Minnesota be informed about any wells on the property--whether those wells are still being used or not. The law applies to all types of water wells: drive-point wells, drilled wells, dug wells, monitoring wells, dewatering wells and ground water thermal exchange systems.

Under the new law, the property owner must provide a formal disclosure statement to the prospective buyer. The statement must include a legal property description, the county, and a map showing the location of each well. The statement must indicate whether the well is in use, not in use, or sealed by a licensed well contractor. If the seller knows of no wells on the property, a statement to that effect must still be provided to the buyer.

Beginning November 1, 1990, the information in the disclosure statement must also be included on a well disclosure certificate, filed with the county recorder. A disclosure certificate does not need to be filed if no wells are known to exist on the property, but the deed must include the statement "The seller certifies that the seller does not know of any wells on the described real property." Disclosure certificate forms will be available on October 15, 1990, at county recorder offices throughout Minnesota.

Property owners are legally responsible for all wells whether or not the well is currently in use. Wells that are currently not in use need to be sealed or the property owner must obtain a maintenance permit for wells that are not currently operable or disconnected from power. These wells must be properly maintained, so they do not endanger health or safety, or contaminate the ground water. The permits are available from the Minnesota Department of Health for a fee of \$50 a year. Maintenance permits are not transferable.

MDH estimates that there may be anywhere from 400,000 to 1.2 million unsealed, abandoned wells

in the state. Many of these wells have been left open, or are in a serious state of disrepair creating a potential health and safety hazard for adults, children, pets and livestock.

Well contractors must file a report with MDH after sealing an abandoned well. MDH advises property owners to keep a copy of the report for their own records.

More information about the state well sealing effort is available by calling the MDH at (612) 627-5147 or 1-800-383-9808, or by writing to the Well Management Unit, Minnesota Department of Health, P.O. Box 59040, Minneapolis, MN 55459-0040.

(Reprinted from *The Minnesota Well Management Newsletter*, September 1990)

Coping With Water Scarcity

Proceedings of the Seventeenth Biennial Conference on Ground Water, are now available.

Entitled *Coping with Water Scarcity: The Role of Ground Water* (May 1990), the publication contains articles on water quality, drought, water supply, conservation, and more.

The proceedings are provided as a part of the University of California's information exchange program in water resources research and is published and distributed by the Director's Office of the California Water Resources Center. To get a free copy contact:

Water Resources Center
University of California
Davis, CA 95616
(916) 757-8901

New Brochures available

The recent EPA publication *Citizen's Guide to Ground Water Protection* (EPA 440/6-90-004) is intended to help citizens take an active role in protecting ground water resources at the local level. For copies of this publication, call or write:

U.S. EPA:
Attn. Jan Gallagher
Office of Ground Water Protection (WH-550G)
401 M Street, SW
Washington D.C. 20460
(202)382-7077

The Minnesota Department of Natural Resources, Division of Waters, has recently produced three brochures:

- *A Guide for Buying and Managing SHORELAND*, which discusses the Shoreland Management, Floodplain Management, Wild and Scenic Rivers, and Protected Waters Permits Programs;
- *Project Summary, Assessing Geologic Sensitivity of Ground Water Resources in Minnesota*, which explains interagency efforts to develop statewide guidelines and criteria for identifying areas sensitive to ground water pollution;
- *Minnesota's Water Appropriation Program*, which describes how the use of water is regulated in Minnesota.

For copies of these publications, call or write

Minnesota Department of Natural Resources
Division of Waters
500 Lafayette Road
St. Paul, MN 55155-4032
(612)296-4800

New Members

Abdelkarim Abulaban

University of Minnesota

Jennifer Baillie

EnPro Assessment Corp.

Bart Biernat

U.S. Geological Survey

Martha C. Brand

Leonard, Street and Deinard

Michael Bratrud

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Terrance P. Brennan

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William C. BuckleyAustin-Mower Environmental
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Moira Campion

DNR - Division of Waters

Karen Christensen

MN Pollution Control Agency

Philip A. Davis

Geosphere Midwest, Inc.

Debbie Deluca

MN Department of Agriculture

Linda Doran

University of Minnesota

Julian Fenendael, P.E.

Comstock & Davis, Inc.

Cathy Fruehe

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Thomas Greene

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TechnoSearch

Rodney J. Ikola

Consulting Geophysicist

Dave Jacobson

ENSR Consulting & Engineering

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MN Department of Health

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Inc.**Joey Lundquist**

Barr Engineering Co.

Bob Macneal

Geraghty & Miller, Inc.

Willis Mattison

MN Pollution Control Agency

Debra McGovern

MN Pollution Control Agency

Shirley McMaster

Bay West, Inc.

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Bruce Liesch Associates, Inc.

Marsha L. Meinders

GME Consultants, Inc.

Shane Missaghi

Nobles County

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Inc.**Gene Murray**Delta Environmental Consultants,
Inc**David Nemetz**

University of Minnesota

Todd Petersen

DNR - Division of Waters

Joe Renier

IT Corporation

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MN Department of Health

Craig Schafer

MN Pollution Control Agency

David A. Scheer

MN Pollution Control Agency

Lisa Scheinost

IT Corporation

Karen J. Severson

Washington State University

Daniel V. Sola

CRA, Inc.

Gerald Stahnke

MN Pollution Control Agency

Dan Stoddard

MN Department of Agriculture

Graham Tobin

University of MN - Duluth

Susan Turner

Barton Sand & Gravel Co.

Patrick T. Tyrrell

Wenck Associates, Inc.

Steven Varberg

Geosphere Midwest, Inc.

Vote for New Officers for Your Association

Bob Karls, President, is joining that distinguished group, the MGWA Past-Presidents. Don Jakes, Treasurer, is ready to hand over the checkbook. Kudos cum laude for all their hard work. Keep your Association serving you, the member, by voting for a new President-Elect and Treasurer. The President-Elect will serve for one year while Gordie Hess is president, and assume the presidency the following year. The Treasurer will take over from Don Jakes on January 1, 1991 and serve for two years.

Fill out the ballot below and bring to the Fall Meeting or mail by November 10 to: Minnesota Ground Water Association, P.O. Box 65362, St. Paul, MN 55165. Ballots will be counted and the results announced at our Fall Meeting on November 14th, 1990.

Mark one choice in each category:

Candidate for President-Elect:

Sheila Grow, Minnesota Department of Agriculture
write-in candidate

Candidate for Treasurer:

Susan Price, HDR Engineering, Inc.
write-in candidate

USGS Call for Section 105 Proposals

The USGS is calling for Proposals for water resources research grants under Section 105 of the Water Resources Research Act. Proposals are to be submitted no later than November 20, 1990. Contact the Water Resources Research Center for a copy of the announcement. Proposals require 1:1 nonfederal:federal funding. Federal funds are limited to a total of \$175,000 over three years. Applications will be considered in six categories: (1) social sciences; (2) ground water flow and transport; (3) water quality; (4) biological processes; (5) engineering; and (6) climate and hydrologic processes. Applications undergo an extensive peer review process. Only about 15% of submitted proposals can be funded.

(Reprinted from *Minne Gram*, Water Resources Research Center, U of M, September 1990)

Chaos Lecture

The AAPG 1990-1991 Distinguished Lecturer, Dr. Chris Barton, will be lecturing at 3:30 pm in Pillsbury Hall 207C November 6, 1990 on the *Practical Applications of Fractal Geometry and Chaos Theory to the Earth Sciences*.

Changes

Pat Bloomgren has accepted the job of Assistant Division Director of the Water Quality Division of the Minnesota Pollution Control Agency.

Gil Gabanski is now at Bruce Liesch and Associates, Inc. He was previously with Foth & VanDyke.

Efie Wahlstrom has joined EnecoTech from GME.

Cindy Bartolerio has moved to Madison, Wisconsin, to work for the Wisconsin DNR.

Steve Thompson moved from Delta to the Minnesota Pollution Control Agency to work for Tanks and Spills.

Tom Heenan now works for Hennepin County Environmental Management.

Bob Nielsen moved to Marshall to work for the Minnesota Department of Health.

Bud Anderson retired ??? from USGS to work for the Minnesota Department of Health.

AIPG Monthly Meeting

The American Institute of Professional Geologists, Minnesota Chapter, hold its monthly meetings at the Roseville Holiday Inn. The meetings are on the first Tuesday of the month and start promptly at 11:30. Call Scott Wolter at 659-1345 for further information or for reservations.

Newsletter Advertising Policy

Advertising space is available in this newsletter to businesses and organizations. Display ads (4 issues = 1 year) are charged by fractional page:

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The Editor has final determination on the acceptance of materials submitted. There are no commissions on ads. Advertising copy must be received by the publication deadlines: February 15, May 15, August 15, or November 15. The ad should be accompanied by a purchase order or a check. Checks should be payable to the Minnesota Ground Water Association. All materials should be sent to the Editor:

Jan Falteisek
Editor, MGWA Newsletter
DNR - Division of Waters
500 Lafayette Road
St. Paul, MN 55155-4032

Join the Minnesota Ground Water Association!

If you are reading this newsletter second-hand, we'd like to take this opportunity to invite you to become a member of MGWA for 1991. Annual dues are \$15 for professional members and \$10 for students. Your dues include 4 issues of this newsletter and the annual membership directory. And you can cast your ballot (page 8) for MGWA officers.

Just complete the form below and mail to: Minnesota Ground Water Association, PO Box 65362, St. Paul, MN 55165

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Groundwater Mechanics

Book review reprinted from the *International Ground Water Modeling Center's Ground Water Modeling Newsletter*.

Strack, O.D.L. 1989. *Groundwater Mechanics*. Prentice-Hall, Englewood Cliffs, New Jersey.

This 732-page text is a remarkable contribution to the theory of fluid flow in porous media. The book, which focuses on solving groundwater problems with analytical techniques, is a comprehensive and systematic treatise on a classical topic in the context of modern mathematics and the advance of computational technology. The philosophy behind the text is to introduce a systematic problem-solving approach through problem simplification and hierarchical analysis, and thus to determine primary questions and answers. To apply this approach, the book employs the analytical function method, a computer-adapted mathematical procedure developed by the author.

This method consists of approximating the solution to groundwater problems by superposing analytical functions describing various groundwater conditions. The analytical function method allows the user to analyze increasingly complex problems or scenarios, or increase the complexity of the analysis when more detailed information on a site becomes available.

The first few chapters discuss the basic concepts of groundwater flow, develop the governing flow equations, and describe the elementary solutions for the most common aquifer configurations. The aquifer configurations presented include shallow confined and unconfined systems, interface flow, aquifers with vertically varying hydraulic conductivity, shallow flow and interface flow in the presence of clay layers, and fully three-dimensional flow. This section of the book introduces the concept of discharge potential as basis for the mathematical formulations in the remainder of the book.

Chapter 3 deals with harmonic solutions and introduces the use of complex variables in groundwater flow.

Chapter 4, devoted to streamlines and pathlines, extends these concepts to the modeling of advective transport of decaying and adsorptive solutes. Chapter 5 presents applications of conformal mapping, while in chapter 6 the analytical function method is introduced as applied to regional flow problems. Chapter 7 focuses on the use of conformal mapping in solving free boundary problems. Chapter 8 discusses the boundary integral equation method, a technique related to the analytical function method.

The book closes with short descriptions of numerical modeling using finite-element and finite-difference methods, and the use of analog methods.

The book is comprehensive in its treatment of analytical techniques in solving groundwater flow problems, specifically those techniques based on complex function theory. It is exceptionally well written, with emphasis on correct and logical development of the mathematical formulations. The text is well-balanced between theory and applications and forms an excellent text for professionals in need of a modern source on groundwater mechanics.

The quality of this book will not surprise those familiar with the long-standing tradition at the Technical University Delft, The Netherlands, in teaching groundwater hydraulics. Dr. Strack obtained his Ph.D. Degree at that institution.

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Court Rules Insurers Liable for Cleanup Costs

The Minnesota Supreme Court ruled June 8 that several insurers are liable under the Minnesota Environmental Response and Liability Act (MERLA) for cleanup costs incurred at Superfund sites.

The 4-3 decision ruled in favor of 3M, Joslyn Corp. and Tonka in their lawsuits against insurance carriers. The Court found that general liability insurance policies do cover the three companies' "damages" at Superfund sites. The MPCA supported the companies' cases.

(Reprinted from *Minnesota Superfund Quarterly*, Sept. 1990, a publication of the Minnesota Pollution Control Agency)

Calendar

November 5 - 9, 1990. MOD-FLOW for Simulation of Ground Water Flow and Advective Transport. To be held in at Bally's Las Vegas in Las Vegas, Nevada by NWWA.

November 5 - 9, 1990. 26th Annual AWRA Conference - "The Science of Water Resources: 1990 and Beyond", "Symposium - Transferring Models to Users". Contact AWRA at (301) 493-8600.

November 6 - 8, 1990. Critical Issues in Underground Storage Tank Management - Focuses on new EPA requirements. To be held at Bally's Las Vegas in Las Vegas, Nevada by NWWA.

November 6 - 8, 1990. Theory and Application of Vadose Zone Monitoring, Sampling, and Remediation. To be held at Bally's Las Vegas in Las Vegas, Nevada by NWWA.

November 6, 1990. Wisconsin Ground Water Association 4th Annual Fall Conference: Science, Technology, and Regulations of the 1990's. To be held in Milwaukee at the Midway Motor Lodge, 251 North Mayfair Road. Registration starts at 7:00 am.

November 7 - 9, 1990. Practical Environmental Law. To be held at the Hotel del Coronado in Coronado CA. Contact Federal Publications, Inc., 1120 20th street NW, Washington DC 20036. (202) 337-7000.

November 8 - 9, 1990. Pesticides in the Next Decade: The Challenge Ahead. To be held in Richmond, VA. Contact Diana L. Weigman, Asst. Director of Research/Admin., Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University, 617 N. Main Street, Blacksburg, VA 24060-3397. (703) 231-5624.

November 9, 1990. Legal Implications of Environmental Site Assessments. To be held at Bally's in Las Vegas, Nevada by NWWA.

November 12 -14, 1990. Effective Techniques For Contaminated Ground water Treatment. To be held at the Wisconsin Center in Madison, Wisconsin, by University of Wisconsin-Madison/Extension, Dept. of Engineering Professional Development, 432 North Lake Street, Madison, Wisconsin 53706. (800) 462-0876 or (608) 262-8592.

November 13 - 15, 1990. Environmental Regulation. To be held in St. Louis, MO. Contact Executive Enterprises, Inc., (800) 831-8333.

November 14 - 16, 1990. Comprehensive Ground Water Contamination Management: a short course for environmental professionals in industry. To be held at the Orlando Marriott in Orlando, Florida, by NWWA.

November 15 - 16, 1990. Field Monitoring with Emphasis on Ground Water Protection. To be held at the University of Toledo Discoll Center for Continuing Education, Toledo, Ohio. Contact The University of Toledo, Division of Continuing Education, Toledo, Ohio 43606-3393.

November 27 - 30, 1990. Practical Karst Hydrogeology with Emphasis on Ground Water Monitoring (tentative). To be held in Cave City, Kentucky by NWWA.

November 29, 1990. Fluid Distribution in Crustal Rocks and Its Effects on Rheology Professor Stephen J. Maxwell, Pennsylvania State University at University of Minnesota Department of Geology and Geophysics Fall Seminar Series. To be held at 110 Pillsbury Hall, Minneapolis, MN 3:30pm.

December 3 - 5, 1990. Principles of Ground Water Hydrology. To be held at the Columbus Marriott North, Columbus Ohio by NWWA.

December 3 - 5, 1990. Fundamentals of Ground Water and Well Technology. To be held at the Marriott Inn North, Columbus Ohio by NWWA.

December 3 - 5, 1990. Environmental Regulation. To be held in

Denver, CO. Contact Executive Enterprises, Inc., (800) 831-8333.

December 3 - 5, 1990. Ground Water Flow and Well Hydraulics. To be held at the University of Wisconsin-Madison, College of Engineering in Madison, Wisconsin. Contact Engineering Registration, The Wisconsin Center, 702 Langdon Street, Madison, WI 53706.

December 3 - 7, 1990. Safety at Hazardous Materials Sites: A Hands-On Workshop. To be held at the Orlando Marriott in Orlando, Florida, by NWWA.

December 5 - 7, 1990. Ground Water Management District Association - 1990 Annual Conference. To be held in Colorado Springs, CO. Contact G.M.D.A. 1990 Annual Conference, P. O. Box 126, Wahoo, NE 68066.

December 6 - 7, 1990. Introduction to the Application of Geo-statistics and Kriging to Spatial Estimation Problems. To be held at the Holcomb Research Institute, Butler University by IGWMC.

December 6 - 7, 1990. Ground Water Flow Through Fractured Media. To be held at the University of Wisconsin-Madison, College of Engineering in Madison, Wisconsin. Contact Engineering Registration, The Wisconsin Center, 702 Langdon Street, Madison, WI 53706.

December 14, 1990. Introduction to Hydrologic & Water Quality Modeling. To be held in New Brunswick, NJ. Contact Jim Morris, Assist. Director, Office of Continuing Prof. Education, Cook College, P.O. Box 231, New Brunswick, NJ 08903, (210) 932-9271.

January 7 - 11, 1991. Incremental Flow Modeling Course. To be held at the Holcomb Research Institute, Butler University in Indianapolis, Indiana by IGWMC.

January 13 - 18, 1991. IBM PC Applications in Ground Water Pollution and Hydrology: A Hands-on Short Course. To be held in San Francisco, California by NWWA.

January 15 - 17, 1991. *Fundamentals of Ground Water and Well Technology.* To be held at the Stoffer Dublin Hotel in Dublin, Ohio by NWWA.

January 28 - 29, 1991. *Minnesota Water Well Association 1991 Convention.* To be held in Minnetonka, Minnesota. Contact Susan J. Church, MWWA, 26 East Exchange St., St. Paul, MN 55101, (612) 290-2823.

February 6 - 8, 1991. *Iowa Water Well Association Convention.* To be held in Des Moines, Iowa. Contact Dennis Scheider, IWWA Executive Director, 900 Des Moines, Ste. 200, Des Moines, IA 50309. (515) 266-2189.

February 20 - 22, 1991. *2nd International Conference: Computer Methods and Water Resources.* To be held in Marrakesh, Morocco. Contact Liz Newman, Computational Mechanics Institute, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton, S04 2AA, England.

February 24 - 28, 1991. *Symposium on Surface and Ground Water Quality: Pollution Prevention, Remediation, and Great Lakes.* To be held in Cleveland, Ohio by AWRA.

March 13 - 14, 1991. *Applied Drilling Engineering for Rotary and Auger Methods.* To be held at the Sheraton Society Hill in Philadelphia, Pennsylvania by NWWA.

March 19 - 21, 1991. *In Situ and On-Site Bioreclamation, An International Symposium.* To be held in San Diego, CA. Contact Battelle Inc., Phillip Wells, (800) 783-6338.

March 20 - 21, 1991. *Nonpoint Source Pollution Conference, the unfinished agenda for the protection of our water quality.* To be held in Tacoma, Washington. Contact State of Washington Water Research Center, Washington State University, Pullman, WA 99164-5531 (509) 335-5531.

March 27 - 29, 1991. *Michigan Well Drillers' Association Convention.* To be held in Grand Rapids,

Michigan. Contact John Schmitt, JP Schmitt & Co., 4471 S. Wagner Road, Ann Arbor, MI 48103-9720.

April 8 - 10, 1991. *Upper Midwest Water Well Expo.* To be held in La Cross, Wisconsin by NWWA.

April 29 - May 2, 1991. *Eighth Thematic Conference on Remote Sensing for Exploration Geology.* To be held in Denver Colorado. Contact Robert H. Rogers, ERIM Thematic Conferences, P.O. Box 8618, Ann Arbor, MI 48107-8618 (313) 994-1200.

May 12 - 18, 1991. *Fourth International Symposium on Land Subsidence.* To be held in Houston, Texas. Contact: A. Ivan Johnson, 7474 Upham Court, Arvada Colorado 80003.

May 13 - 16, 1991. *Outdoor Action Conference/ Expo.* To be held in Las Vegas, Nevada by NWWA.

May 20 - 24, 1991. *American Institute of Chemical Engineers International Conference on Modeling and Mitigation Consequences of Accidental Release of Hazardous Materials.* To be held in New Orleans, Louisiana. Contact R. E. Emmert, AIChE Executive Director, 345 East 47th St., New York, NY 10017 (212) 705-7660, ext. 61.

June 2 - 3, 1991. *Symposium on Water Supply and Water Reclamation.* To be held in San Diego, California by AWRA.

June 3 - 5, 1991. *Fundamentals of Ground Water and Well Technology.* To be held at the Radisson Hotel in Monroeville, Pennsylvania by NWWA.

September 8 - 13, 1991. *Water Management of River Systems and Resource Development of the Lower Mississippi River.* To be held in New Orleans, Louisiana by AWRA.

October 16-19, 1991. *American Institute of Professional Geologists Annual Meeting.* to be held in Gatlinberg, Tennessee. Contact Lawrence I. Benson, ERC/EDGE, P.O. Box 22879, Knoxville, TN 37933-0879 (615) 966-9761.

October 21-23, 1991. *National Water Well Expo.* To be held in Washington, D.C. by NWWA.

October 21-24, 1991. *Geological Society of America Annual Meeting.* To be held in San Diego, California. Contact GSA, Meetings Department, P.O. Box 9140, Boulder, CO 80301 (303) 477-2020.

November 6-7, 1991. *Applied Drilling Engineering for Rotary and Auger Methods.* To be held at the Tampa Marriott Westshore in Tampa, Florida by NWWA.

November 19-22, 1991. *Petroleum Hydrocarbons Conference and Expo.* To be held in Houston, Texas by NWWA.

For information about meetings and seminars to be held by the AWRA, contact Michael C. Fink, Meetings Manager AWRA, 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20814-2192 (301) 493-8600, Fax (301) 483-5844.

For information about meetings and seminars to be held by the NWWA, contact NWWA at 6375 Riverside Drive, Dublin, Ohio 43017 (614) 761-1711, Telex 241302.

For information about Short Courses held by the International Ground Water Modeling Center (IGWMC), contact the IGWMC, Holcomb Research Institute, Butler University, Indianapolis, IN 46208 (317) 283-9458.



Call For Papers

GSA North-Central Section 25th Annual Meeting, Toledo, Ohio April 18-19, 1991

Symposia:

- The Geology of Radon,
- State Geological Surveys and Natural History Museums - A resource for the Earth Science Teacher,
- Consultants' Innovative Applications in Geophysical/Hydrological/Engineering Geological Techniques in Environmental Investigations,
- Scientific Drilling and Geophysical Investigation in the Mid-Continent.

Poster Sessions are highly encouraged for both students and professional members

Abstracts must be submitted BY December 12, 1990 on official 1991 GSA abstract forms from:

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Moosehead Environmental Campaign

During the month of October the Canadian brewer Moosehead contributed \$1.00 to enhancing wildlife conservation in the U.S. for every 6-pack of beer sold. Moosehead officials estimate that as much as \$50,000 could have been raised by the promotion.

Each Moosehead dollar will be matched by federal funds appropriated to the National Fish and Wildlife Foundation, which will use the money to protect wetlands under the North American Waterfowl Management Plan, and to improve the political and communication skills of wildlife managers.

"The Moosehead partnership is a prime example of how the business community can take a leadership role in raising funds that will directly benefit America's wildlife resources," said Chip Collins, the Foundation's director.

(Reprinted from *Land Letter, The Newsletter for Natural Resources Professionals*, July 1, 1990)

Production Note: Now here's a campaign geologists can contribute to. This newsletter was duly produced using only Moosehead purchased before October 31, 1990.

Give the Gift of Ground Water Knowledge

For about \$200, you can establish a ground water section in you local high school library. It is a great way to earn a tax deduction, get some media coverage, and most important, introduce students to ground water and well technology at the same time.

NWWA has a list of suggested books to buy. Donate the books to the superintendent of schools, the librarian, and the principal on the condition that the school officially add a ground water section to their library. Announce to the press where you plan to formally make the donation and have a photographer available to record the presentation. It will make a nice human interest story, and don't forget to inform the IRS at tax time.

For a list of suggested books, send a stamped, self-addressed envelope to: School Books, NWWA, 6375 Riverside Drive, Dublin OH 43017.

Changes in Petrofund

The 1990 Legislative amended the Petrofund. The amendments provide much-needed insurance relief to Minnesota tank owners. However, the legislation also ends reimbursement for a common "cleanup" cost.

Under the new provisions just added to Petrofund, tank owners who comply with state and federal storage tank laws are eligible to receive reimbursement for up to 90 percent of their leak-cleanup costs up to \$1,000,000 per leak, an increase from the previous limit of \$250,000.

The Minnesota Pollution Control Agency (MPCA) pushed for this increase because the federal government requires most tank owners to have \$1,000,000 in pollution insurance, and many can't afford it. The MPCA is working to get EPA approval for Minnesota's tank owners to cite the Petrofund as fulfillment of 90 percent of the insurance requirement.

Owners will still need some type of pollution-liability insurance to cover their ten percent of cleanup costs, but the burden of maintaining a \$1,000,000 policy should soon be removed.

The legislature also made a second change to the Petrofund because they perceived an inequity in reimbursing removal costs for a tank owner who had a leak at his or her site, while not providing any relief for a tank owner who removed a tank from a *clean* site. The change discontinues reimbursement for all costs associated with removing a tank.

There are several other notable changes in the new legislation. The amendments now exclude from reimbursement petroleum refineries and tank facilities with more than one million gallons capacity. Larger facilities are most often self-insured, and don't need government assistance in meeting federal insurance requirements. Along the same lines, the amendments also limit the total amount of reimbursement any one site can receive to \$2,000,000.

Proposed Rules Governing Limited Dewatering and Sealing Licenses; Construction Permits

The law concerning wells and borings, Chapter 1031, was amended in May of this year. Laws of Minnesota 1990, Chapter 597, created a new limited well contractor license for persons constructing, repairing, and sealing dewatering wells, and amended the limited well sealing license. The law defines which activities can be done with each of these licenses, establishes the license fees, bond requirement, continuing education requirement and the requirement to take and pass an examination. The law requires the Health Department to make rules concerning the issuance of licenses.

The Health Department has proposed amendments to the Water Well Construction Code, Chapter

4725, to establish the experience requirements for licensing limited dewatering well contractors and limited well sealing contractors, and to amend the requirements for dewatering well permits. The proposed rules were reviewed by the Advisory Council on Wells and Borings and an advisory task force consisting of licensed well contractors, dewatering contractors, and representatives of the pump and plumbing industry.

A summary of the proposed rules follows:

- A limited dewatering well contractor may install a pump in a dewatering well.
- A person with a limited well sealing license may seal wells, remove obstructions from a well before sealing, remove or perforate well casings before sealing, or other activities necessary to seal a well.
- A person must have three years of experience to obtain a limited well sealing license. The experience must be gained under a

licensed well sealing contractor or a licensed well contractor. A year of experience is a year in which the applicant:

- A. personally sealed a minimum of five wells; and
- B. worked a minimum of 1,000 hours per year drilling wells, clearing obstructions, removing or perforating well casings, and grouting wells.

- A person with a limited dewatering license may construct, repair, or seal dewatering wells.

A person must have two years of experience to obtain a limited well contractor license to construct, repair, or seal dewatering wells. A year of experience is a year in which the applicant:

- A. worked a minimum of 500 hours designing, constructing, or field supervising the construction, repair, or sealing of dewatering wells; and

B. designed, constructed, or field supervised the construction of a minimum of five dewatering wells.

- A dewatering well permit may be issued to the limited dewatering well contractor or the well contractor.

The proposed rules were published in the State Register on October 8, 1990. The Health Department is proposing to adopt the rules without a public hearing unless 25 or more people submit a written request for a hearing. A 30-day comment period will be held between October 8, 1990, and November 7, 1990. Interested persons can submit comments supporting or opposing the rules. Rules may be modified if the modifications are supported by documentation and the modifications do not result in substantial change. A public hearing will be held on November 14, 1990, only if 25 or more persons request a hearing. Comments supporting or opposing the proposed rules or requests for a hearing should be submitted to: Ronald D. Thompson, Minnesota Department of Health, Well Management Unit, P.O. Box 59040, Minneapolis, Minnesota 55459-0040, (612)627-5151. A copy of the proposed rules or the statement of need and reasonableness may be obtained by writing or telephoning Ronald Thompson.



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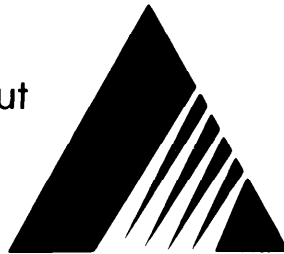
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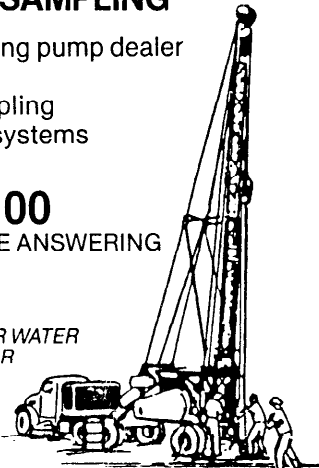
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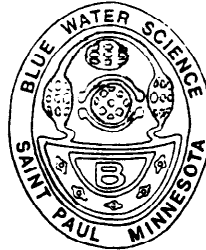
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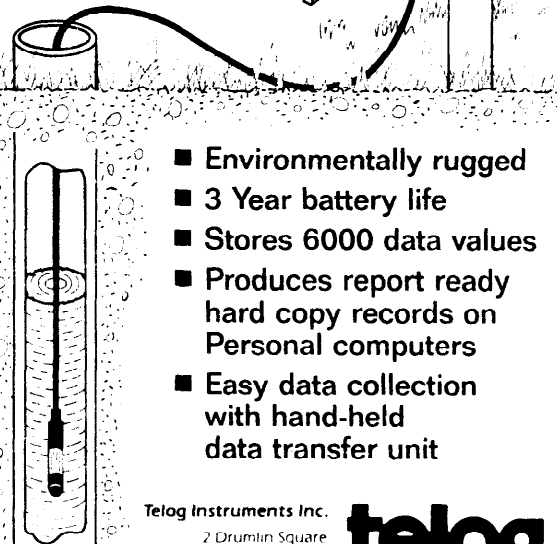
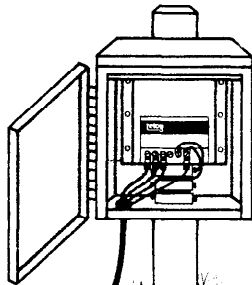
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REGISTRATION

Fall Meeting

Environmental Risks - Contrasting Perceptions

November 14, 1990
Thunderbird Hotel
Bloomington, Minnesota
8:30 a.m. to 3:30 p.m.

Agenda

8:30 - 9:00	Registration
9:00 - 10:00	Dr. David H. Belluck , Toxicologist Minnesota Pollution Control Agency
10:00 - 11:00	Dr. Vernon Houk , Assistant Surgeon General Center for Environmental Health and Injury Control Centers for Disease Control
11:00 - 12:00	Dr Jay H. Lehr , Editor Journal of Ground Water
12:00 - 1:00	Lunch Provided
1:00 - 2:00	Janet Hathaway , Senior Project Attorney Natural Resources Defense Council
2:00 - 2:15	Break
2:15 - 3:30	Question and Answer Session from Panel G. Robert Johnson, Esq. Popham, Haik, Schnobrich & Kaufman David Gray , Chief of Health Risk Assessment Dept. Minnesota Department of Health Barbara Scott Murdock , Editor Health and Environment, Fresh Water Foundation
3:30	Question and Answer Session from Audience Adjorn

Attend the Fall Conference on Environmental Risks!

The conference fee of \$40 pays for the facility, lunch and the expenses of our speakers. Please send in your registration today. We'd also like to take this opportunity to invite all nonmembers to join the Minnesota Ground Water Association for 1991. See page 9 for more information.

Registration Form

Name _____
Title _____
Affiliation _____
Mailing Address _____

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Make your \$40 checks payable to the Minnesota Ground Water Association. Will you need a receipt in addition to your cancelled check? _____. If yes, receipts can be picked up at the conference registration desk.
Mail to: Minnesota Ground Water Association, P.O. Box 65362, St. Paul, MN 55165

Mark your Calendar Now for these Upcoming Meetings:

November 9, 1990: Fractal Geometry and Chaos Theory: the practical applications in the earth sciences. 1990-1991 AAPG Distinguished Lecturer, Dr. Chris Barton. 3:30 pm Pillsbury Hall, Minneapolis Campus, U of M.

November 14, 1990: Environmental Risks - Contrasting Perceptions. 8:30 am - 3:30 pm at the Thunderbird Hotel, Bloomington.

**Minnesota Ground Water Association
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