# Minnesota Ground Water Association

Volume 8, Number 1: April, 1989

## President's Page

*By Linda Lehman, L. Lehman & Assoc.*

**Focus on Russia: Armenian Water Supply Rehabilitation**

In the last newsletter, I discussed our plans for raising money for water supply rehabilitation in Soviet Armenia. Since that time, we have raised $1600.00. I presented the check to Commissioner David

Speer, Minnesota Department of Trade and Economic Development, on St. Patrick's Day. Speer, the Western Bank of St. Paul, and the Armenian Cultural Organization have created a fund which now totals approximately $110,000 for Armenian rehabilitation. Currently, they are considering three options for this money:
(1) construct an orphanage
(2) construct a wing of a hospital, or (3) construct several homes

Our $1600 is dedicated to water supply hookup for any of these options.

Contributions came from the following persons and organizations:
Minnesota Ground Water Association,
American Water Resources Association,
Arizona Hydrologic Society,
Colorado Water Well Contractors Association
L. Lehman & Associates, Inc.,
Linda Lehman, and
Mr. & Mrs. M.B. McNiel

**Back from the U.S.S.R.**

At the invitation of the University of Minnesota, Professor Valery Mironenko and two of his associates from the Leningrad Mining Institute will be in town the week of April 17.

The Leningrad Mining Institute is interested in developing cooperative agreements with the University of Minnesota and the University of Arizona. They hope to develop exchange programs for faculty, graduate students and research projects. The week-long visit will include a trip to University of Minnesota - Duluth, the DNR facility at Hibbing and various state agencies in St. Paul.

The visitors are most interested in meeting ground water professionals like yourself, who are working in this ever expanding field. We have arranged for them to attend the upcoming Darcy Lecture, April 20 at 7:00 p.m. The reception which follows at 8:00 p.m. will give you a rare opportunity to discuss ground water issues with your Soviet counterparts while enjoying food and libations. The lecture and reception are free, so please join us at the University for what promises to be a very worldly meeting!

Students requiring financial assistance to attend the Darcy Lecture, please contact your geology/civil engineering advisors to obtain money from our MGWA Student Assistance Fund, or call me for details at 894-0357.

**Darcy Lecture on April 20**

**The Utility of Geochemical Modeling**

Dr. Randy Bassett, University of Arizona

- 7-8 p.m. Room 3-210, NEW Electrical Engineering and Computer Science Building, U of M
- 8-10 p.m. Reception - Refreshments
  Meet your Soviet counterparts
  Winchell Reading Room
  Pillsbury Hall, U of M

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## Spring Meeting a Success

On February 13, 1989, the Minnesota Ground Water Association sponsored a half-day seminar entitled "Property Transfer: Environmental Liability and Site Assessment". Over 100 professionals and 5 students were in attendance to hear the many excellent presentations. On the following pages of this issue of the newsletter we feature several summary articles by the speakers; the paper entitled *The identity of the "Responsible Person" when Property is Transferred* by Dennis M. Coyne of Hart, Bruner, & O'Brien, the keynote speaker, was distributed at the seminar; additional copies are available.

A special thanks to Jeanette Leete and Don Jakes for organizing the seminar and to **Warzyn Engineering, Inc.**, **EnPro Assessment Corp.**, **Braun Environmental Laboratories**, and **NOVA Environmental Services** for providing the refreshments, and to **Delta Environmental** for assisting with the mailing of announcements.

## Federal Agencies to "Go Metric" by 1992

The Omnibus Trade and Competitiveness Act of 1988 contains a section that amends the U.S. National Metric Act of 1975 to state that Congress directs each Federal Agency to convert to the metric system by 1992.

Metric conversion was included in the OTCA Bill because Congress realized that a metric changeover can make the U.S. economy stronger by helping industry compete in the international trade markets. The Common Market countries have agreed to prohibit the sale of non-metric dimensioned products in their countries after 1992.

Members wanting more information on the metric section of the 1988 Omnibus Act can contact A. Ivan Johnson, Chairman, ASCE/COM, 7474 Upham Court, Arvada, CO 80003.

## Property Transfer Issues from the PCA Perspective

*By Robyn Livermore, Site Assessment Unit, Minnesota Pollution Control Agency*

As state and federal environmental laws have changed, individuals and business have become increasingly concerned about the financial risks associated with transfer of land where hazardous substances may have been released. Federal and state Superfund legislation has created incentives for those involved in real estate transactions to inquire into past uses of property. For example, the federal Superfund Amendments and Reauthorization Act of 1986 (SARA) contains language designed to limit the liability of so-called "innocent landowners" who had no reason to know that a property was contaminated. Under SARA, the burden is placed on the landowner to establish that at the time of acquisition he undertook an appropriate inquiry into the previous ownership and uses of the property.

Understandably, prospective property buyers and lending institutions in particular are interested in obtaining information about parcels of property before making an investment. And where there is already evidence of contamination or when there is a special need to establish that "appropriate inquiry" has been made, these parties often need assistance in planning and carrying out the investigation or cleanup.

As a result of this increased interest, staff at the Minnesota Pollution Control Agency (MPCA) have been responding to a growing number of requests for file searches and cleanup oversight. In 1985, the MPCA received two requests for file searches; in 1986, 44 such requests were received. In 1987, after the passage of SARA, the number increased to 325. In response to these demands, the 1988 legislature made an appropriation from the state Environmental Response, Compensation, and Compliance Fund to provide the MPCA with additional staff and resources to handle the increased workload.

The property transfer program was created by a 1988 amendment to Minnesota's Superfund law (the Environmental Response and Liability Act or ERLA). Minnesota Statutes section 115B.17, subdivision 14, authorized the MPCA to assist the public in determining whether a property has been the site of a release or threatened release of a hazardous substance, pollutant or contaminant, and to assist in or supervise the development and implementation of reasonable and necessary cleanup activities. It also provided that the requester pay the MPCA's costs of providing the service.

The property transfer program is managed by the MPCA's Ground Water and Solid Waste Division. Staff in two sections of the Groundwater and Solid Waste Division perform two different activities in the property transfer program:

- Staff in the Program Development Section perform file evaluations, which are reviews of agency records and files for evidence of contamination at or near a property.
- Staff in the Site Response Section perform technical evaluations to ensure that sites with suspected contamination are properly investigated and cleaned up. They do this by reviewing and approving investigation plans and reports and by monitoring clean-up activities.

### FILE EVALUATIONS

A routine file evaluation involves a review of several lists, maps or data bases on file at the MPCA to identify listed sites at or within a mile of the property:

- The National Priorities List (NPL) is a national listing of hazardous waste sites which represent a significant threat to public health or the environment, and are priorities for remedial action. These sites are eligible for federal Superfund monies.
- The Permanent List of Priorities (PLP) is a state listing of hazardous waste sites which represent

a significant threat to public health or the environment and are priorities for remedial action. These sites are eligible for state Superfund monies.

- The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) is the U.S. Environmental Protection Agency's database of sites which have had or are in need of federal Superfund investigations.
- The Regulatory Compliance, Hazardous Waste Enforcement Log is a listing of facilities which are currently receiving elevated levels of enforcement activities by the MPCA Hazardous Waste Program, i.e., Stipulation Agreement, Notice of Violation, Administrative Penalty Order, etc. Inclusion on this list may be due to administrative ("paperwork") violations as well as those applying to waste storage or disposal.
- The List of Permitted Solid Waste Facilities is a listing of those facilities or areas in the state which have been issued permits for the handling or disposal of solid waste.
- The Hazardous Waste Permit Unit Project Identification List is a listing of facilities which have received or are in the process of receiving a permit for treatment, storage, and/or disposal of hazardous waste. The most common permit is for storage and is required for facilities which store their hazardous waste on-site for longer than 90 days.
- The 1980 Metropolitan Area Waste Disposal Site Inventory is a collection of maps which show the location of abandoned dumps, demolition sites, and other types of waste disposal sites in the Twin Cities metropolitan area. Because the majority of these sites were discovered prior to the creation of the MPCA, detailed information regarding the status of these sites is generally not available.
- The 1980 Statewide Open Dump Inventory is a collection of lists and maps which show the locations of municipal waste disposal facilities, industrial surface impoundments, and closed municipal dump sites throughout the state.

A routine file evaluation will also include a review of the Underground Storage Tank Information System (USTIS), which is a data base containing information about underground storage tanks, leaking underground storage tanks, and spills of petroleum products and/or hazardous substances. The routine review will determine whether a registered underground storage tank, leaking underground storage tank or spill has been reported at the street address or under the facility name provided in the request. It will also identify leaking underground storage tanks within the zip code areas indicated in the request, and spills that have been reported within the city or county in which the property is located.

Requests for file evaluations must be in writing and should include the following:

- the street address of the property and any or all names it may be known under;
- a map showing the location of the property;
- the zip code areas to be reviewed for leaking underground storage tanks; and
- the city (if the property is located within city limits) or county (if the property is outside city limits) to be reviewed for spills.

Routine file evaluations are usually completed within two to four weeks of the MPCA's receipt of the request. Prospective property buyers should plan accordingly. We receive many phone calls requesting priority status because of approaching deadlines; such requests are too numerous to honor. Requests for file evaluations will be honored in the order that they are received.

During 1988, the MPCA received 964 requests for file evaluations. The busiest month we have had so far was December 1988, when we received 107 requests. Of these, 88 came from consulting firms, 8 from attorneys, 2 from banks, 4 from realtors or developers, and 5 from individual citizens.

## TECHNICAL EVALUATIONS

If those involved in a property transfer transaction want to take extra steps to establish that they have made "appropriate inquiry" or if preliminary research has revealed a possible contamination problem at the property, the interested party may undertake a pre-purchase environmental investigation or audit. Staff in the Site Response Section will provide assistance at this stage by performing technical evaluations of the work plans, reports, and activities that result from such an investigation.

The audit begins with an extensive history and background search. During this search, a representative of the interested party may visit the site to look for evidence of contamination, look at aerial photographs and insurance maps, interview local officials, and examine state and local agency files. Upon request, Site Response staff will review reports to determine whether this research is adequate and complete. They will also determine whether the case falls within the regulatory scope of a different division within the agency.

The next step may be on-site sampling to evaluate soils and ground water at the property. Upon request, Site Response staff can suggest what to look for, where to look and how best to carry out the process. They will review the investigation plans and reports to assure that these address all the potential problems on the site, and indicate areas where additional work may be needed to better-define areas of contamination.

If investigations discover any actual contamination, the MPCA must be notified. If the contamination problem is very serious or requires a very large-scale cleanup, the case will probably be referred to the federal or state Superfund program; however, if the contamination is less serious and interested parties are willing to volunteer to investigate or remediate it, staff in

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the Site Response section will provide technical expertise by reviewing and approving "mini-cleanup" plans and activities.

In the event that the person requesting Site Response technical evaluation is no longer willing or able to continue to investigate or remediate the contamination, the site will be referred to the Superfund regulatory program for follow-up.

**CHARGES**

The MPCA charges for file evaluations and technical evaluations. The current charge for file evaluations is $35 per hour for two hours of staff time. The charge for technical evaluations averages $48 per hour. The amount of time required for technical evaluation varies considerably. These charges are based on current workload and estimated expenses. They will be reviewed periodically and adjusted if necessary.

If you have questions about the MPCA's property transfer program, you may call:

**Robyn Livermore** at (612) 297-2956 or

**Mary Buchen** at 297-1796 for information about property transfer file evaluations and

**Gerald Stahnke** at (612) 297-1799 or

**Byron Adams** at 296-7744 for information about property transfer technical evaluations.

## Announcement

The University of Minnesota, Geology and Geophysics Department and Leningrad Mining Institute, Leningrad, USSR are in a process of organizing a trip for students and professionals to Leningrad, USSR. The length of the trip will be between 2 weeks and one and a half months during July-August 1989. The cost of the trip is not yet determined.

If you are interested, please contact Roman Kanivetsky, Minnesota Geological Survey, 2642 University Avenue, St. Paul, Minnesota 55114, telephone (612) 627-4780.

## MPCA's Site Assessment Program for Potential Hazardous Waste Sites

*By Ron Swenson, MPCA*

Through a Cooperative Agreement with the U.S. Environmental Protection Agency (EPA), the Minnesota Pollution Control Agency (MPCA) has established a program to assess potential hazardous waste sites in Minnesota. The MPCA's program has been designed to verify the presence of hazardous substances at a particular site and to assess a site's potential for harming human health and the environment. The Site Assessment Program represents the initial phases of a hazardous waste site investigation under the state and federal Superfund programs.

The Site Assessment Program currently consists of the following four (4) phases: Preliminary Assessment (PA); Screening Site Inspection (SSI); Listing Site Inspection (LSI); and Hazard Ranking System (HRS) scoring. A detailed discussion of each phase is provided below.

**Preliminary Assessment**

Prior to conducting a PA, a site which is identified as a potential site is entered into EPA's Comprehensive Environmental Response, Compensation, and Liability Information System. This system is a listing of all potential and actual hazardous waste sites reported to the EPA nationwide.

A PA involves a general review of readily accessible information to characterize and to determine if the site warrants further action. The information gathered during a PA includes: a site history (type of industrial or commercial activities and owner/operator relationships), known or alleged hazardous substances present (quantity, characteristics, method of disposal), and the potential effect the contamination may have on the nearby population and environment. As part of the PA, sites are assigned a high or medium priority for an SSI. A site may also be rated "No Further Remedial Action Planned" in which case an SSI is deemed not necessary. It should be noted that these ratings are subject to change as more information becomes available. In general, a PA is completed within a one-week period.

**Screening Site Inspection**

An SSI is conducted to verify the presence of contaminants and to provide a sufficient data base to determine if a more expanded investigation is necessary for ranking the site according to its actual or potential hazard. To accomplish these objectives, site specific data on the hazardous substances present, pollutant dispersal pathways, types of receptors, and site management practices are obtained. As SSI typically includes the following tasks:

- a limited collection and analysis of ground water, surface water, soil, or air samples;
- survey and document site structures, topography, lagoons, drainage, drums, bulk tanks, monitoring wells, roads, access points, boundaries, etc.;
- document location of potentially affected homes, public buildings, potable wells, natural areas, other populations, etc.; and,
- review owner/operator records.

At the present time, SSI's are being conducted by either the EPA (through a regional contractor) or the MPCA. It may take up to a year to schedule and complete an SSI.

If a more expanded investigation is determined to be necessary, based on the information collected during the SSI, an LSI will be conducted; else the site is given a "No Further Remedial Action Planned."

**Listing Site Inspection**

An LSI is conducted on a site which is likely to make EPA's National Priorities List but more data is needed in order to arrive at a more defined HRS score. An LSI typically includes the tasks conducted in an SSI; however, much more data is collected and typically includes installing ground water monitoring

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wells. Currently, only EPA's contractor will be conducting LSI's

**Hazard Ranking System Scoring**

If, as a result of the preliminary investigative activities, a site is verified as a hazardous waste site, the site is ranked against other sites according to its relative severity. This is accomplished by using the HRS scoring model which uses the information gathered during the PA, SSI, and LSI. HRS scores are used to establish priorities among sites and to determine a site's eligibility for federal and/or state Superfund monies for response actions.

After completing the three phases of the Site Assessment program, a hazardous waste site may be added to the EPA's National Priorities List and/or the MPCA's Permanent List of Priorities. A Remedial Investigation/Feasibility Study (RI/FS) is then conducted for the site to determine the extent of contamination and to evaluate response action alternatives. After the RI/FS is completed, appropriate response actions (i.e., source removal, ground water withdrawal, etc.) are undertaken at the site.

If you have questions about the MPCA's Site Assessment program, you may contact **Ron Swenson** at (612) 297-1793.

## Call for Abstracts

22nd Annual Water Resources Conference
November 8 - 9, 1989
University of Minnesota
St. Paul, Minnesota

Applicants should submit a brief abstract of their presentation or exhibit by April 30, 1989.

Suggested topics include: Computer Applications, Erosion/Sedimentation, Hydraulics, Hydrology, Watershed Planning, Water Quality, Non-Point Source Pollution, Pollution Control, and Ground Water. Address submittals to:

Lyn Diaz, 221 Nolte Center
University of Minnesota
315 Pillsbury Drive S.E.
Minneapolis, MN 55455

## Environmental Liability and Real Estate Transactions

*by Jim Benson, S.I.O.R., of Benson, Malkerson & Bradbury, Inc. The following notes are from Jim's talk at our spring meeting.*

As those involved in commercial and industrial real estate are well aware, the present environmental and pollution laws affect nearly every real estate transaction.

Today, federal and state environmental legislation, together with the liability explosion, imposes on the real estate broker a greater duty to the public. This is a new duty to investigate and disclose all material matters in the transfer of real estate.

Perhaps as little as 20% of all real estate transactions involve buyers and sellers who are totally aware of all environmental issues affecting the transfer of real estate. That puts the broker on the front firing line for as high as 80% of all real estate transactions. The real estate broker is often the first person to bring up environmental issues.

I have identified, at a minimum, five changes in property transfer due to environmental issues from the viewpoint of the real estate broker.

First, there is a dramatic change in the way brokers list, market and document real estate transactions. No longer can the broker rely on information from the seller when listing the property. The broker should make reasonable inquiries to state and municipal authorities concerning any known pollution issues involving the subject property or adjoining properties. The broker should establish a questionnaire to determine the seller's knowledge of any environmental issue; and include indemnification language in the listing agreement and contracts.

Perhaps most importantly, the broker is now asking for first phase environmental audits to be performed by the seller to identify any environmental liability in advance of listing and marketing the property. The broker is now obligated to provide a new service in the transfer of real estate - disclosure to the buyer of all environmental issues.

Documentation of real estate transfers has also changed. Virtually every purchase agreement now contains a contingency which allows the buyer to examine all environmental liabilities. Today purchase agreements also contain warranties and indemnifications so the buyer will have private, contractual recourse against the seller in case of future environmental liability.

A second change in property transfer is the longer time period between the date the purchase agreement is signed and the actual closing of the real estate transaction. Environmental investigation takes time. A normal thirty day contingency for examination of a property may now easily be stretched out to six months to investigate all environmental liability.

A third change is the increase in cost for real estate property transfers. The manageable cost for a first phase environmental audit can quickly escalate, depending upon the size and complexity of the property. The unanticipated cost of an environmental cleanup has startled more than one buyer and seller.

The fourth change is the direct effect of property pollution on real estate value. The cost to cure any environmental problem is a direct reduction against property value. To establish an accurate market value of a property suggests again the need for an environmental audit prior to the listing and marketing of a property.

The last change in property transfers states that environmental issues have rewritten the liabilities for buyer, seller, and the real estate broker. The best that each can hope for is risk reduction - not elimination.

The best results for all are achieved by thorough property investigation and disclosure of adequate and reliable information and documentation of the process.

## Interpretation of Data collected during a Phase I Environmental Audit

*by Shawn Ruotsinoja, Braun Environmental Laboratories, Inc.*

Phase I Environmental Audits are conducted to determine what, if any, environmental risks may be associated with a property investment. Environmental risks may include soil and groundwater contaminated with hazardous substances, and structures containing asbestos or hazardous materials. These risks have the potential to reduce the value of real property.

A Phase I Environmental Audit typically consists of a history review and a reconnaissance of a property of interest, and perhaps also a Asbestos/Hazardous Materials Survey.

A Phase I Environmental Audit determines the presence or sources of potential or actual environmental hazards on a property of interest based on historic land use activities of that property. A Phase I Environmental Audit may also identify potential or actual off-site sources of contamination that could be detrimental to the property.

Many purchasers and lending institutions can make their investment decisions based on a Phase I Environmental Audit. However, if environmental hazards are identified, it may not be adequate for the buyer to feel comfortable about the investment. If potential or actual sources or indicators of contamination, either on or off the property, are identified, a Preliminary Subsurface Investigation (Phase II) of the property may be necessary to determine if soil and/or groundwater contamination exists.

A Phase II investigation may include, but is not limited to, soil borings, the installation of groundwater monitoring wells, and laboratory analysis of soil and groundwater samples.

What data indicate that soil and/or groundwater sampling and analysis is necessary in order to verify contamination?

The answer to whether a Phase II Environmental Audit is warranted is dependent on whether the sources or indicators of actual or potential contamination are located on or off the property.

On-site sources or indicators of contamination may be a definite concern; just their presence alone may be reason enough to consider soil and groundwater sampling and analysis. A number of identified sources or indicators of actual or potential contamination on-site should raise a "red flag" and suggest the need for a subsurface, or Phase II, investigation. Examples of these "red flags" are:

- Spills of hazardous substances or petroleum;
- Underground storage tanks;
- Solid waste disposal areas (dumps or landfills);
- Deteriorated drums which had contained hazardous substances, or drum storage areas; and
- Areas of illegal disposal of chemical wastes.

On the other hand, one may not consider off-site sources or indicators of actual or potential contamination a significant concern. Several factors should be taken into account in order to assess whether or not these off-site sources or indicators of contamination have affected, or could affect, the property of interest. Factors to consider are:

- The proximity of actual or potential contaminant sources to the property of interest;
- The severity of the contamination or release of hazardous substances;
- The depth to groundwater and groundwater flow direction; and
- Whether or not responsible parties have been identified, and if remedial actions have been conducted at these sites.

Considering the factors above, a worst case scenario would be a contaminated site located adjacent to the property of interest, with documented contaminated groundwater flowing toward the property, and with no remedial actions undertaken to clean up the adjacent site.

In summary, a Phase I Environmental Audit requires thorough documentation and assessment of information about actual or potential on-site and off-site environmental hazards. Upon close examination of on-site "red flags" and factors related to potential environmental impacts from off-site sources, one can assess the need for a Phase II Environmental Audit.

## Water Well Program Management in Minnesota

*Reprinted from The Minnesota Ground Water Newsletter, a publication of the Minnesota Department of Health, Volume 9, No. 1*

**Task Force Recommendations to Affect the Well Industry**

During the summer of 1988, Commissioner of Health Sister Mary Madonna Ashton assembled an advisory group on well management to consider the development of a comprehensive program to deal with ground water and well-management problems in Minnesota.

The advisory group's charge was to consider proposals to develop a comprehensive state well management program. This included proposing recommendations for better well management and options for program funding. In addition, the group was charged with making recommendations on revisions to strengthen the Minnesota well code. Some of the group's recommendations will be of particular interest to the water well industry.

**The recommendations are:**

- To develop local county well programs.
- To expand the state program by 49 full-time staff positions and 12 temporary positions at a cost of approximately $2.9 million.
- To develop a cost-share program to assist well owners to seal wells.
- To propose methods to generate revenues.

**Funding recommendations are:**

- Increase the annual license fees for well contractors from $50 to $250.
- Establish an annual fee of $250 for limited licenses.
- Increase the registration fees for well drilling rigs from $5 to $100 and impose a pump rig fee of $50.
- Establish well construction permit fees of:

$150 for wells designed to produce less than 10,000 gallons per day and serve 25 persons or less;

$300 for wells designed to produce more than 10,000 gallons per day or serve more than 25 persons;

$50 for monitoring wells. A special fee structure for multiple monitoring wells installed for a single project should be developed.

- Require annual maintenance permits for all monitoring wells.
- Impose fees for unused wells which have not been properly abandoned.

**Recommendations for Improving Well Code Compliance**

- Permit required for all water wells and monitoring wells.
- Develop a comprehensive legal definition of an abandoned well.
- Require an annual maintenance permit for temporarily abandoned wells.
- Disclosure of active and abandoned wells during property transactions. Administrative penalties for failure to seal or disclose wells at this time.
- Fees to be set to cover variance requests.
- When a replacement well is constructed, the decommisioned well must be sealed or an annual maintenance permit obtained.
- Fines for code violations.
- Reference made in the well statute to the provision in Minnesota Statutes, Chapter 145A. that local governments have the power to declare abandoned wells public health nuisances and consequently can be sealed, with the cost assessed to the well owner.
- Pump and elevator shaft installers will be licensed.
- Require insurance performance bonds for licensed water well contractors and monitoring well engineers.
- Continuing education requirements in order to renew annual licenses.
- Exam and experience requirements for new monitoring well engineers.

Many of the task force recommendations are incorporated into the Ground Water Bill which is under consideration during the 1989 legislative session. In the meantime, some interim guidance has been provided as outlined in the following article on Water Well Code Policies.

## MDH WATER WELL CODE POLICIES

**Near-Grade Monitoring Wells:**

The Minnesota Water Well Construction Code requires that all wells be completed at least one-foot above grade. In unusual circumstances (such as some situations at service stations) where it may not be possible to meet the Code, alternative construction may be used, but only upon **prior** approval by the Minnesota Department of Health.

**Bentonite Pellets:**

The Well Code requires grouting be performed by adding the mixture through the casing or a grout pipe from the bottom of the space to be grouted upward to the surface in one continuous operation. For monitoring wells where bentonite pellets are needed as an intermediate seal to prevent cement from leaking into the screen, an alternate grouting method may be needed. The following procedures may be used:

- Bentonite pellets may be free-poured where standing water is less than 50 feet and the total well depth is less than 80 feet.
- The pellets must be properly implaced to assure an effective seal. If bridged, the well must be resealed and abandoned.
- The pellet seal may extend up to five feet above the screen.
- The bentonite pellets shall contain 85% of the mineral montmorillonite and shall meet API specifications Standard 13A (March 1966). Saline, acid, or alkaline substances or other additives to cause a temporary increase in viscosity of the bentonite slurry are not permitted. Only untreated bentonite may be used. Until the National Sanitation Foundation develops an approved list of drilling products, the user should request only untreated bentonite for use as drilling or sealing material.
- This interim guidance will remain in effect until the Well Construction Code is revised.

*If there are any questions, please contact Jim Nye (612-623-5339).*

## Borehole Geophysics Applied to Ground-water Investigations

*USGS News Release*

USGS Open-File Report 87-539 by W. Scott Keys provides comprehensive information on geophysical logging techniques that are widely used in ground-water hydrology or that have significant potential for application.

The report is an update of the TWRI (released in 1971) by Keys and MacCary entitled "Application of borehole geophysics to water-resources investigations." This recent report emphasizes those techniques that have changed most since 1971, and includes discussion on some newer logging techniques, such as the acoustic televiewer, that have become widely used since 1971.

The report provides guidance useful for selecting the logging techniques most appropriate to obtain the information needed for the rocks and fluids penetrated and indicates the required borehole conditions and potential limitations of each technique.

The logging techniques discussed include: spontaneous potential, resistance, resistivity, gamma, gamma spectrometry, gamma-gamma, neutron, acoustic velocity, acoustic televiewer, caliper, fluid temperature, conductivity, and flow.

For each logging technique the following topics are discussed: principles and instrumentation, calibration, and standardization, volume of investigation, extraneous effects, and interpretation and applications.

Multiple-choice tests are supplied at the end of some of the sections on related types of logging techniques to help the reader determine whether significant points are understood; answers to those tests are given at the end of the report.

For copies contact: Books and Open-File Reports, USGS Federal Center, Box 25425, Denver, CO 80225, (303) 236-7476.

## WELLHEAD PROTECTION IN WESTERN EUROPE

*By Dr. Hans-Olaf Pfannkuch, Professor of Geology at the University of Minnesota.*

*Dr. Pfannkuch has recently returned from a 6-month trip to investigate ground-water protection strategies in Europe. On January 27, 1989, Olaf gave a talk about his findings to 45 attendees gathered at the Minnesota Department of Health. His talk is summarized below.*

Due to Western Europes's high population density, pollution problems occurred there as early as hundreds of years ago. Contamination issues became a major concern in Europe before there was any awareness of such problems in the Americas.

If one compares Minnesota's population density of 20 people/square kilometer to West Germany's density of 240 people/square kilometer the difference becomes clear. Most of Western Europe's drinking water is from ground-water sources (France 66%, Germany 82%, Switzerland 90%), and therefore wellhead-protection programs were necessary and have been in place in Europe since 1953.

The presence of pesticides and nitrates in ground water is a big concern. The European nitrate standard is 50 mg/l ($NO_3$), which is about equivalent to our standard of 10 mg/l of nitrate-nitrogen. Most of the ground water in Denmark and Brittany now has nitrates above the standard.

Under such conditions, zero degradation can only be enforced in certain designated zones. These zones, at their simplest, take the form of concentric rings around a given public-supply well. The goal of protection zones is to prevent the entry of pollutants to an aquifer by the restriction of land use. Problems arise in finding the most scientifically-correct shape of these zones, and in the surveillance of land use in established zones.

Designing scientifically-correct zones requires knowledge of the geology, the flow field, and the mass transport properties of both the aquifer and any potential contaminants. Time and dilution come into play also. Specific parameters involved include aquifer type (where in the spectrum between water-table or confined), flow path (thickness of the vadose zone, etc.), aquifer material (fractures, granular, etc.), applicable flow equation (based on above), aquifer properties (such as surface area), and flow-field configuration (geometry of permeability differences).

Once the above parameters are known, pumping stress can be applied (with computer simulation) and the head differences mapped as elongated ring-like protection zones. Each ring selected will define a certain travel time (e.g., 50 days, 1 year, etc.). Of course, a safety buffer must be added to each protection zone. To calculate for the worst case, one uses the greatest water-table steepness and the largest pumping rates foreseeable.

The above scenario costs a lot, and the Europeans have grown to accept several more economical methods for protection zoning. For instance, (1) some simply designate 100 meters for zone 2 in all cases, and then use transmissivity to determine the outer circle, (2) some apply a "variable shape method" which uses a curve template in combination with data on flow direction, (3) others employ a standard analytical method, and (4) some employ hydrogeologic mapping. Most European countries visited combine travel time and a fixed distance.

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West Germany employs protection zones as part of a wellhead protection program mandated by Water Management Law. These zones are: Zone I is at least a 10 by 10 meter area around the well. The outer edge of Zone II represents 50 days time of travel to the well. The outer edge of Zone IIIA is a 2 kilometer distance from the well (or a longer travel time). Zone IIIB covers the remaining distance to the drainage area boundary. Depth to water influences the radius of Zone II. If the water table is less than 4 meters below the surface, normal calculations prevail. If the water table is greater than 4 meters below the surface, adsorptive properties of the soil are included in the calculations (allowing smaller zones). Confined aquifers have a similar Zone I, but are allowed an even smaller Zone II and IIIA (based on abandoned well or fracture data).

Land-use planning guidelines are followed in each zone. Land-use zoning has been enforced for over 100 years in Europe, and is publicly acceptable. Zone I is usually bought by the municipality and fenced for restricted entry. No use of the land, other than growing grass without fertilizer, is allowed. Zone II can have no underground or surface tanks of polluting materials, radioactive plants or storage, camping, cemeteries, military maneuvers, or increases in groundwater temperature. Only organic fertilizers may be used, and pesticides are restricted. Atmospheric dryfall is monitored, and less than 25% of the land surface may be made impermeable. Zone IIA can have no nuclear plants, landfills, pipelines, or hazardous-material transport. Zone IIIB, if there is room for it to exist, contains no siting restrictions.

West Germany requires such zoning for 14,000 wellheads. Sixty-eight hundred of these plans had been enacted by 1988, 4,000 were in process, and 3,000 haven't started yet. The areas of enacted zones I and II occupy 1.3% of W. Germany, and zones I, II, and III combined occupy 8.9% of the country. Some residents claim they are being zoned out of their economic livelihood. Up to 40 parties may be involved in establishing one wellhead protection zone, and many arguments must be resolved over often long periods of time.

In another European example, France passed sweeping legislation in 1964 requiring 20,000-30,000 wellhead protection plans. The law is not yet retroactive to pre-1964 wells. A guidebook for tackling delineation problems is in progress there. The French rely more on vulnerability maps and geology. They extend the inner zones in areas of vulnerability.

French wellhead protection is often in private, not municipal, hands. Six financial basin offices operate the water resources in France. They tax the water users and take fees from polluters. Part of the money is used for treatment-plant and incineration-plant projects. The activities of these offices must be laid out by a certified hydrogeologist. Each county has a certified hydrogeologist who establishes zones and approves new industrial development. For about 5,000 francs, he will "declare an area of public utility" for your proposed well. This expense is reflected in the French water bills, which are about 4 times as expensive as those in Minnesota.

Most western European nations think wellhead protection is worth its problems and costs, but the reclamation problem is another story. France simply writes off certain of its most polluted areas. Without the equivalent of a Superfund, cleanup costs must be borne by the owner. Since wellhead protection zones have been enforced, very few incidents of pathogen contamination have occurred in Europe. Domestic wells are exempt from regulation because so few exist in Europe.

For example, due to population density, 99% of Holland is on public supply. Denmark, however, has a population similar to Minnesota and has well-developed protection plans. In Minnesota such activities can be more efficient and less costly, due to our low population density and relatively minor pollution history.

## New U.S.G.S. Publications

### Water is being exported from Minnesota Watersheds

The report, *Inventory of Interbasin Water Transfers in Minnesota*, by Lee Trotta has been released as a U.S. Geological Survey Open-File Report 88-466.

### Sources of Water Use Information in Minnesota

The sources of water-use information in Minnesota are listed in U.S.G.S. Open-File Report 87-40, a handout prepared by Lee Trotta.

Water-use information may have to be gathered from several sources before the amount of water used for a particular purpose can be estimated. For example, livestock water use data is computed using census data from the Department of Agriculture and other organizations, such as the Minnesota Turkey Growers Association. DNR is the most comprehensive source of data on individual water users in the State due to the DNR's water-use database.

### Methods of Totaling Water-Use Data for Minnesota Explained

Data on water use by individuals, industries, farms, and municipalities in Minnesota are stored in a Department of Natural Resources data base - the Minnesota Water-Use Data System. Before this information can be transferred to the National Water-Use Data System maintained by the U.S.G.S., data must be totaled by county and by watershed. The procedures are described in the report "Aggregation of water-use data and transfer of data to the National Water-Use Data System: Procedures and programs," U.S.G.S. Open-File Report 87-40, by L.C. Trotta.

The above reports are available for inspection at the U.S. Geological Survey, 702 Post Office Building, 180 East Kellogg Boulevard in St. Paul, and can be purchased from the U.S.G.S. Books and Open-File Reports Section, Federal Center, Box 25425, Denver, Colorado 80225, in paper copy and microfiche.

## Calendar

**April 10 - 13, 1989** *Orchestrating Automated Mapping/Facilities Management for the 1990's*, to be held at the Marriott Hotel in New Orleans, Louisiana. Contact AM/FM International Englewood CO (303) 779-8320.

**April 11, 1989** *Assessing Ground Water Sensitivity to Contamination*, to be held at the Earle Brown Conference Center at the University of Minnesota. Sponsored by the Water Resources Research Center, MGWA, MGS and the Center for Agricultural Impacts on Water Quality.

**April 17 - 21, 1989** *Applied Ground Water Modeling*, to be held at Butler University in Indianapolis, Indiana by the IGWMC.

**April 19, 1989** *Industrial Wastes Disposal: 1989 Concerns and Remedies,* to be held in Rockford, IL. Contact Federation of Environmental Technologists, Inc. PO Box 185, Milwaukee, WI 53201.

**April 19 - 22, 1989** *The Geologic Modeling of Depositional Environments and its Application to the Ground Water Professional - A Field Seminar,* to be held in Charleston, South Carolina by NWWA and repeated September 27 - 30, 1989.

**April 20 - 21, 1989** *North-Central Section of the Geological Society of America Annual Meeting,* to be held in Notre Dame, Indiana. For more information, contact: Sandra Rush, GSA Communications Department, Box 9140, 3300 Penrose Place, Boulder, Colorado 80301.

**April 21 - 25, 1989** *Nonpoint Source Conference - Making Nonpoint Pollution Control Programs Work,* to be held in St. Louis, Missouri. For more information contact: NACD, 1052 Main St. Steven's Point, Wisconsin 54481.

**May 1 - 3, 1989** *Groundwater Information Management Workshop,* to be held in Omaha, Nebraska by the Interstate Conference on Water Policy in Cooperation with the USGS. Contact the Nebraska Natural Resources Commission.

**May 2 - 3, 1989** *Environmental Site Assessments in Conjunction with Real Estate Transactions,* a two day course to be held at the Boston Marriott in Burlington, Massachusetts by NWWA.

**May 7 - 12, 1989** *AGU 1989 Spring Meeting,* to be held in Baltimore, Maryland. Contact AGU at 2000 Florida Ave NW, Washington, DC 20009.

**May 8-12, 1989** *Applied Geophysics for Problems of the Environment.* To be held in Waterloo, Ontario, Canada by the University of Waterloo. Contact the Waterloo Centre for Groundwater Research, Waterloo, Ontario, Canada N2L 3G1.

**May 10 - 11, 1989** *Radium and Radon in the Environment,* to be held in Milwaukee, Wisconsin at the Center for Continuing Engineering Education, University of Wisconsin - Milwaukee. For more information, contact: Stephen J. Scott (414) 227-3115.

**May 10 - 19, 1989** *IAHS Third Scientific Assembly,* to be held in Baltimore, Maryland. The Third Scientific Assembly will be a forum for review of the latest developments in the field of hydrology. For more information, contact: IAHS Assembly, c/o AGU, 2000 Florida Ave. NW, Washington, D.C. 20009.

**May 20 - 25, 1989** *The Third National Outdoor Action Conference on Aquifer Restoration, Ground Water Monitoring, and Geophysical Methods,* to be held in Orlando Florida by NWWA.

**June 7 - 9, 1989** *International Symposium on the Design of Water Quality Information Systems,* to be held in Fort Collins, Colorado. Contact Robert C. Ward or Jim C. Loftis at Colorado State University (303) 491-1058.

**June 12 - 16, 1989** *Design of Water Quality Monitoring Networks - Short Course,* to be held in Fort Collins, Colorado. Contact Robert C. Ward or Jim C. Loftis at Colorado State University (303) 491-1058.

**June 25 - July 1, 1989** *Karst Hydrology,* to be held at the Center for Cave and Karst Studies, Department of Geography and Geology, Western Kentucky University, Bowling Green, KY 42101.

**June 27 - 30, 1989** *AWRA Symposia on "Headwaters Hydrology" and Indian Water Rights & Water Resources Managment",* to be held in Missoula, Montana. Contact AWRA, 5410 Grosvenor Lane, Suite 220, Bethesda, MD 20814-2192.

**July 11 - 13, 1989** *Principles of Ground Water Hydrology,* to be held at the Westin Galleria, Dallas, Texas by NWWA. Will be repeated in September in Dublin, Ohio.

**July 14, 1989** *Environmental Site Assessments,* to be held at the Westin Galleria, Dallas, Texas by NWWA. To be repeated in August in Columbus, Ohio in September in San Francisco, and in December in San Diego.

**July 23 - 28, 1989** *IBM PC Applications in Ground Water Pollution and Hydrology: A Hands-On Short Course,* to be held in Princeton, New Jersey by NWWA.

**August 6 - 10, 1989** *Charting the 90's, New Visions for Urban Technology,* to be held at the Boston Mariott Copley Place. Contact URISA 319 C St. SE, Washington, DC 20003.

**August 22 - 24, 1989** *Theory and Application of Vadose Zone Monitoring and Sampling,* to be held in Columbus, Ohio by NWWA.

**August 22 - 24, 1989** *Theory and Application of Borehole Geophysics to Ground Water Problems,* to be held in Columbus, Ohio by NWWA.

**August 6-10, 1989** *URISA '89 Urban and Regional Information Systems Association,* to be held

at the Boston Marriott Copley Place. Contact URISA 319 C Street, SE, Washington, DC 20003.

**September 11 - 14, 1989** *Analysis and Design of Aquifer Tests,* to be held in Columbus, Ohio by NWWA.

**September 22, 1989** *Legal Implications of Environmental Site Assessments,* to be held in Salt Lake City, Utah by NWWA.

**September 19 - 21, 1989** *Principles of Subsurface Contaminant Fate and Transport Modeling,* to be held in Salt Lake City, Utah by NWWA.

**September 19 - 21, 1989** *Microbial Processes in the Degradation of Ground Water Contaminants,* to be held in Salt Lake City, Utah by NWWA.

**October 19 - 20, 1989** *Third Annual Midwest/Great Lakes Arc/Info User Conference,* to be held in Madison, Wisconsin. Contact Michael Bohn, Wisconsin Geological and Natural History Survey, 3817 Mineral Point Road, Madison, WI 53705.

**November 28 - 30, 1989** *Risk Assessment for the Ground Water Scientist,* to be held in San Diego, California by NWWA.

**November 12 - 17, 1989** *National Water Quality Symposium,* to be held in Orlando, Florida by USGS Water Resources Division. Contact Gary Pederson, Southeastern Regional Office, Atlanta, Georgia (404) 331-3394.

**December 11 - 12**, 1989. *National Symposium on Non-Point Water Quality Concerns - Legal and Regulatory Aspects.*, Ground water overdraft protection is one of the topics. Contact Donald L Pfost, University of Missouri, Columbia (314) 882-2731.

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

*For information about Short Courses held by IGWMC, contact Margaret Butorac, IGWMC, Holcomb Research Institute, Butler University, Indianapolis, IN 46208 (317) 283-9458.*

## Changes

**John Morley** has joined Edward Kraemer and Sons.

**David Jaeger** has joined Bruce A. Liesch & Associates.

**Bruce Olsen** will be running the Department of Health's Wellhead Protection Program.

**John Fax** has joined the Department of Natural Resources Division of Waters.

**Jim Almendinger** is now at the Limnological Research Center at the University of Minnesota.

James M. Montgomery, Inc. has acquired E. A. Hickok & Associates; now **JMM/Hickok.**

**Ed Schneider** is now with the Water Supply and Engineering Section within the Minnesota Department of Health.

**Geraghty & Miller, Inc.** has moved to new offices at 105 Fifth Ave. South, Minneapolis, MN 55401, (612) 339-9434.

**Jonathan Nedved** is now with Protox, Inc.

Christine Olsenius has formed **Christine Olsenius and Assoc.**, at 2327 Lafayette Rd., Wayzata, MN 55391, (612) 471-7795.

Leggette, Brashears & Graham, Inc. announced the promotion to Senior Hydrogeologist of **Scott M. Lapham, John E. Dustman** and **Robert N. Braunstein.**

## New Publications

The Freshwater Foundation announces the publication of **Agrichemicals and Groundwater Protection: Resources and Strategies for State and Local Management,** the full proceedings of a national conference held in October 1988 in St. Paul, Minnesota.

The conference highlighted nearly 50 usable, practical information resources and implementable model programs presently in place and available to assist states, local entities and farmers in more effectively balancing agrichemical use and groundwater protection.

This 416-page compilation of **practical, nontechnical** presentation addresses such topics as:

- Farmers and Information: Perceptions, Sources and Needs
- Farmers Sharing Best Management Practices
- Agency Perspectives: USGS, USDA and U.S. EPA
- Information Systems (5 examples)
- State and Local Initiatives (16 case studies)
- Industry and Training Initiatives (6 case studies)
- Education and Nonprofit Initiatives (5 case studies)

Conference sponsors included the Freshwater Foundation, U.S. Geological Survey, Soil Conservation Service - USDA, Extension Service - USDA, and the U.S. Environmental Protection Agency, along with 14 additional cooperating organizations.

Copies of the 1988 conference proceedings can be purchased from the Freshwater Foundation.

**Nitrates and Ground Water: A Public Health Concern**

- An increasing number of water wells tested for nitrates exceed the current nitrate standard.
- Exposure to excessive levels of nitrates from drinking water may lead to increased incidence of methemoglobinemia in infants, especially those under three months of age. It may also contribute to methemoglobinemia in susceptible adults.
- Although researchers need to conduct further studies to determine the relationship between nitrate exposure and cancer, preliminary studies indicate that long-term exposure to nitrates may increase the incidence of various health risks in humans.

**Nitrates & Groundwater: A Public Health Concern** is a 16 page booklet which describes how nitrate affects human health, both in infants and adults, and offers preventive strategies and specific guidelines for protection of drinking water supplies.

In an easy to understand, nontechnical Q-and-A format, the brochure answers such commonly asked questions as:

What are Nitrates?
How do they get into groundwater?
How much nitrate is too much nitrate?
What is methemoglobinemia?
Can nitrates in drinking water cause cancer?
Can nitrates be removed from water?
What can you do if your well has high levels of nitrates?

To receive a free copy of **Nitrates and Groundwater: A Public Health Concern,** write the Freshwater Foundation at the address below.

**1988 Journal of Freshwater**

The Journal provides a nontechnical overview of concerns and responses related to the use of agrichemicals and their potential for contaminating groundwater.

**FACT:** Fertilizer use increased fourfold from 1960 to 1980, and pesticide use has tripled since 1964.

**FACT:** Nearly half the U.S. depends on groundwater for drinking, including 97 percent of rural populations.

**FACT:** At least 17 pesticides have been found in groundwater in 23 states, and nitrates have been found in 20 percent of wells tested throughout the country.

The concern is real and there is much that we can do. **Agrichemicals and Groundwater: Perspectives and Solutions** is the title of the 1988 Journal of Freshwater, just published and now available from the Freshwater Foundation.

Copies of publications can be ordered from the Freshwater Foundation, 2500 Shadywood Road, Box 90, Navarre, MN 55392. For charge orders, call (612) 471-8407.

## Fish Farmers no Threat as Water Users

In these days of drought, folks want to know that every drop of water is being used efficiently.

A study of Fish Farming in Minnesota was made by the U.S. Geological Survey, in cooperation with the Minnesota Department of Natural Resources.

The results show that if there are water wasters in Minnesota, Fish Farmers are not counted among them.

Although over 141,000 acres of water were used in Fish Farming operations in 1984, those ponds and streams are still available for use. The water in fish holding tanks must be at least periodically replaced, however. This pumpage, usually from wells or municipal supply, has been estimated and rates are given for both game fish and bait fish (hatchery and non-hatchery) operations. Discarded holding-tank water is not reduced in volume, only quality. Total pumpage for all fish holding tanks is only 0.73 million gallons per day in Minnesota, far less than the 60 million gallons per day consumed by Minnesota livestock (the smallest of use categories monitored by the State).

Copies of the report, *Water use for aquaculture in Minnesota, 1984,* by Lee C. Trotta has been released as a U.S. Geological Water-Resources Investigations Report 88-4159. Copies are available for inspection at the U.S. Geological Survey, 702 Post Office Building, St. Paul, Minnesota 55101, and can be purchased from the U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Building 41, Box 25425, Denver, Colorado 80225, at a cost of $1.50.

## Ground Water Standards - Two Different Perspectives

### What's in A Number?

*by Michael Apgar, Chair, Regulatory Officials Committee, National Water Well Association, excerpts from an article in Briefings*

As a refresher for anyone who missed the past few years or can't remember them, numerical ground water standards have been touted as a means of notifying everyone of their obligations vis-a-vis protection and management of ground water and a means of achieving uniform results in ground water protection and management. Numerical standards would establish legally enforceable levels and provide regulatory agencies with added enforcement clout and, therefore, protection of the nation's resources.

On the other hand, numerical ground water standards have been castigated as technically difficult to establish (there are so many contaminants), unrealistically restrictive in specific applications (depending on local availability and use of ground water ), and exorbitant expensive (especially in cleanup) to achieve. For these reasons, numerical standards could be inefficient and wasteful of our nation's treasure (as well as highly frustrating to regulators).

It's been widely recognized that geohydrologic conditions - and the resultant vulnerability to contamination and value as a source of water supply or stream baseflow - vary widely. This variation is obvious across the country but also exists to a less obvious (but often significant) degree across one's yard.

We've already got standards for drinking water - with many more in the works - and criteria for industrial water use requirements and for stream quality. Certainly, ground water quality should meet these requirements at the point where the withdrawal for use or baseflow discharge occurs. The establishment of generally applicable standards for ground water would either be duplicative, inconsistent or grossly inappropriate depending on circumstance.

All this indicates that ground water quality standards should be narrative - not numeric - and applied on a case-by-case basis. Aquifer classification in the sense of "what have we here" should also be employed on a case-by-case basis, be site specific and flexible, not in broad brush strokes. Remember the significant variation in one's yard - typically part of the area is used for waste disposal and attenuation from the septic system and past for a water supply well. Both can be compatible on a small parcel. We don't want to rule out either one!

Ground water quality management should be conducted within a broad framework, but the actual determination of quality requirements or of permitted activities (which is essentially the same type of decision) should abide by the principle of subsidiarity. That is, the responsibility for decision-making should rest with a smaller, more intimate circle involved in a matter, rather than with a larger, more anonymous community. If we're going to optimize benefits while avoiding intolerable harm, decision-making - including the acceptable condition of ground water quality - must be made by those parties closest to and potentially directly affected.

The process which determines how ground water is managed must be flexible enough to allow for professional discretion and local preference. This certainly isn't a new or profound thought, but it should be enough to tell us that national numerical ground water quality standards - where tied to a broad classification system or not - should not be contemplated further!

Concerned ground water scientists should attempt to work toward squelching the proposal to develop national ground water standards this year. A growing number of young, talented ground water scientists join us every year, so the ability to make appropriate ground water management decisions based on technical understanding of local ground water conditions is continually improving.

*Michael Apgar is with the Delaware Department of Natural Resources and Environmental Control. His views do not necessarily reflect those of his employer.*

### Ground Water Quality Standards in South Dakota

*by Barbara K. Nielsen, South Dakota Department of Water and Natural Resources, Ground Water Quality Program, reprinted from an article in Briefings*

South Dakota recently developed and adopted ground water quality standards and ground water discharge permit regulations. The goal of the regulations is to:

1. Maintain existing water quality for present and future beneficial uses,
2. Prevent contamination,
3. Correct ground water pollution problems, and
4. Closely control the degradation associated with economic and social necessity.

The South Dakota ground water quality standards classify ground water and set standards. Ground water with an ambient concentration of 10,000 milligrams per liter (mg/L) or less total dissolved solids (TDS) is classified as having a beneficial use for drinking water supplies. Ambient concentrations and numerical ground water quality standards are used to maintain and protect the existing and future beneficial uses. Ground water with an ambient TDS concentration greater than 10,000 mg/L has no specific beneficial uses or standards, but no further degradation of ambient water quality is allowed without appropriate permits.

The quality standards for ground water of 10,000 mg/L TDS concentration or less are numerical standards based on health related effects, or the ambient value,

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whichever is the better water quality. The numerical standards are the Safe Drinking Water Act maximum contaminant levels (MCL's) for public water supplies with some exceptions. Also included are cyanide at 0.75 mg/L weak acid dissociable (WAD), fluoride at 2.4 mg/L, nitrite at 1.0 mg/L, total hydrocarbons at 0.1 mg/L, and polychlorinated biphenals (PCB's) at 0.000001 mg/L. Standards for chloride, pH, sulfate and TDS have also been set, based on aesthetic effects. In addition, a list of potential toxic pollutants which are primarily pesticides and other organic compounds is included. Standards for these parameters are set at non-detectable. If an MCL is set by the EPA for any of these parameters, the MCL may be adopted as a standard.

The ground water quality standards are used with the regulations to permit discharges to ground water. The standards have also become cleanup goals for ground water contamination due to releases or spills of petroleum and hazardous substances.

## Geotechnical Engineering Corp. Assumes Client Base from Subterranean Eng. Corp.

Roseville-based **Geotechnical Engineering Corporation** has made a major expansion of its operations by the recent acquisition of the client base and project files formerly served by Subterranean Engineering Corporation, according to Geotechnical's President Robert Pendergast.

All Subterranean Engineering geotechnical operations were discontinued as of the first of the year, in order for the company to concentrate its efforts on other engineering, land planning, and management services.

Geotechnical Engineering will continue to operate from its main office in Roseville and a satellite office in Apple Valley.

## Old Orchard Soils Hold Lead and Arsenic

*reprinted from the Health & Environment DIGEST**

Apple and cherry orchards, a hallmark of Wisconsin's Door County since the turn of the century, have left an uneasy legacy: residues of lead arsenate pesticides. A Wisconsin Department of Natural Resources study found that lead and arsenic concentrations in Door County soil range from 48,000 mg/kg in one former mixing area to median surface concentrations of 388 mg/kg in other mixing areas, 360 mg/kg in former apple orchards, and 51 mg/kg in former cherry orchards.

A Wisconsin Health Department review to determine safe levels of lead and arsenic in soil and water concluded that preschool children are at highest risk for several reasons. First, their normal developmental behavior involves considerable hand-to-mouth activity. Second, because of their lower body weight, the same dose presents a greater hazard to a child than to an adult. And finally, children absorb a higher percentage of ingested lead than adults do.

To maintain children's blood lead levels below 15 *ug*/dl, soil in areas where children play should have no more than 500 mg/kg (ppm) lead. Rototilling soil with lead levels between 300 and 500 ppm should lower soil lead concentrations, since soil beneath the surface is less contaminated. For arsenic, levels should be kept below 100 ppm. It is recommended that citizens who garden in former orchards have the soil tested.

Some lead is leaching into ground water; arsenic has been found to be moving through the soil column, but has not yet reached ground water. While sampling has not found arsenic above the lower detection limit (10 *ug/l*), elevated lead has appeared in some private water supplies. Health officials recommend continued monitoring.

**The Health & Environment Digest is a monthly publication of the Freshwater foundation. The Foundation supports a variety of research and educational programs dealing with freshwater resources. To contact the Foundation, write to: Freshwater Foundation, 2500 Shadywood Rd., PO Box 90 Navarre MN.*

## 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**. Annual dues are $10 for professional members and $5 for students.

Just complete the form below and mail to: Minnesota Ground Water Association, c/o Don Jakes, 943 Lydia Drive, Roseville, MN 55113

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Name _____

Affiliation _____

Mailing Address _____

City, State, Zip Code _____

Telephone Number _____