

# Minnesota Ground Water Association

www.mgwa.org

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## Science Museum Flowing Well — The First Step in Building a Public Ground Water Display

*By MGWA Foundation Board members Cathy Villas-Horns, Minnesota Department of Agriculture, and Gilbert Gabanski, GJG Environmental Consultants.*

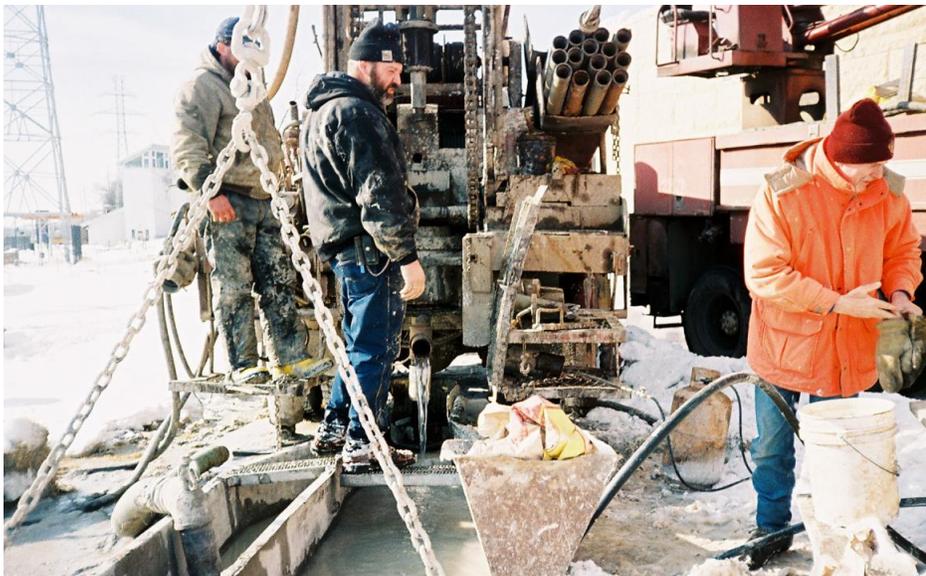
The well is in, and it's a beautiful thing.

The Science Museum of Minnesota (SMM) received four bids in mid-November 2004 to install the bedrock well for the ground water exhibit in the Big Backyard (BBY). Based on careful consideration of all of the bids, Mineral Service Plus (MSP) was selected as the driller based both on cost and on previous experience with drilling bedrock wells at the BBY. Back in 2003 MSP installed a vertical heat exchange loop in each of four wells finished in the Jordan Sandstone (JDN) at a

depth of 250 feet below ground surface (bgs). The uppermost bedrock at that location, in the far western portion of the BBY, was the Prairie du Chien Group (PDC), encountered at a depth of 52 feet bgs. The non-native materials overlying the PDC included clay, wood, debris and even an antique glass bottle that bobbed up, intact, to the surface of their mud tank. At one point the debris plugged up MSP's mud pump and forced them to stop work. Then, once the JDN was penetrated the well started to flow above ground, which was not expected. Eventually the heat loops were successfully installed in the well and these now provide auxiliary heating and cooling to the BBY's self-sustaining exhibit building.

Before drilling could commence, we met several times with the Minnesota Department of Health (MDH) to review the location of the proposed well and its proximity to nearby storm and sanitary sewers. SMM had gone

— continued on page 3



— Gamma logging of Science Museum well. Mineral Services Plus drillers Greg Segler (left) and Randy Storms (middle), and Bruce Bloomgren (right), Minnesota Geological Survey. Bruce is getting ready to log the well. Photo: Gil Gabanski.

## President's Letter

First, congratulations and thank you to Chris Elvrum on the very successful completion of his year as our President. Thank you also to Eric Hansen for his years of contributions as our Treasurer. Welcome to Dale Setterholm, President Elect, and to Craig Kurtz, our new Treasurer. Through the coming years, I look forward to working with Dale and Craig in addition to Chris and Jon Pollock, who is continuing as Secretary.

We have a challenge ahead of us. It will be hard to match the series of successful events of this past year. The Spring Conference on "Ground Water Contamination: State of the State" was informative and well attended. That conference was followed by a Calcareous Fen Workshop and a fall field trip in the karst region with our Wisconsin neighbors. The Fall Conference on the "Management and Analysis of Ground Water Data" was an overwhelming success. I'm sure we're up to the challenge.

Now onward into 2005...Mark May 19 on your calendars as the date of this year's MGWA Spring Conference.

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### 2005 Newsletter Deadlines

Issue	To Editor
June	05/13/2005
September	08/12/2005
December	11/04/2005

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### President's Letter, cont.

This year we have the bonus of an additional conference day. The North Central Section of the Geological Society of America (NCGSA) is holding their conference in Minneapolis on May 19 and 20. The planning committee approached us about the possibility of joining our spring conference with theirs since the two events were scheduled within weeks of each other. After due consideration, we've decided to give it a try. A symposium on Ground Water Sustainability already been planned for the NCGSA conference was transformed into MGWA's Spring Conference. For the same price of admission MGWA members will be able to attend both conferences. What a deal!

The Ground Water Sustainability Symposium is designed to present a blend of technical and policy talks in order to give an indication of the complexity of this topic and to provoke thought. Several nationally and internationally known experts will be joining us to discuss everything from the meaning of sustainability to specific applications of ground water science in the pursuit of sustainability. Hopefully, attendees will be challenged to consider their professional role, whether policy or applied science, in relation to other roles.

Thanks to the perseverance of a small group of dedicated members, the Minnesota Ground Water Foundation's effort to establish an outdoor ground water education exhibit at the Science Museum of Minnesota took a huge step forward this winter with the completion of a 300-foot deep well in the Jordan Sandstone. Although this project is described elsewhere in this newsletter, I want to extend the thanks and gratitude of our organization to Cathy Villas-Horns and Gil Gabanski for all their efforts in seeing this project through.

Hope to see you all in May at the Spring Conference!

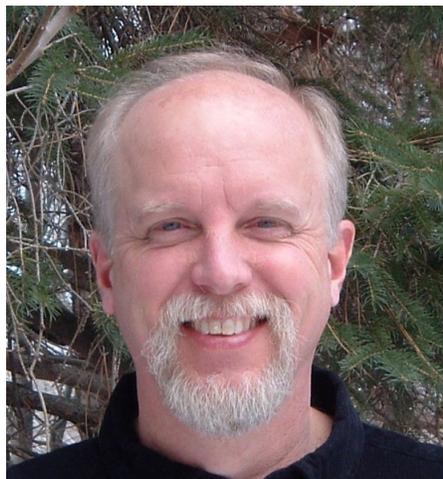
*Laurel Reeves, MGWA President*

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### New MGWA Officers

#### Dale Setterholm, President-Elect

Much of Dale's professional work has been directly related to ground water. He has worked on geologic mapping in many areas of Minnesota, especially through the County Geologic Atlas Program. Early on he worked with the County Well Index. In recent years he's been involved in project, program and personnel management, as Assistant Director of the Minnesota Geological Survey. His focus is on improving geologic programs to serve ground water professional's needs.



#### Craig Kurtz, Treasurer

Craig is a senior hydrogeologist in the Water Engineering Group of the consulting firm, Short Elliott Hendrickson, Inc. (SEH) in Vadnais Heights. With over 12 years of experience, he currently directs and manages the well-head/source water protection and groundwater flow modeling projects at SEH, in addition to well siting studies and municipal well design. He will be graduating in December 2005 from the University of St. Thomas with an MBA in Finance. Craig has been a member of the MGWA since 1993.



## Science Museum Well, cont.

through an exhaustive process of looking for the best location in the BBY to place the well, but most of the BBY is not suitable for well installation because of the many buried and overhead utilities and the existing exhibits. In particular, SMM did not want an "electric hazard" notification on the well because of a nearby electric line. We finally arrived at the only location that would work but it still required a variance for the storm and sanitary sewers. We had planned for this and had sent out bids requesting installation of a double casing through the PDC. Our planning, and meetings and discussions with the MDH were critical to working out the variance request, which was submitted and approved by the MDH.

Drilling of the well for the ground water exhibit of the BBY commenced on January 18, 2005. This time around, MSP had installed several screens in their mud tank to prevent clogging of the pump from debris in the overburden. The well was designed to be a 4-inch by 8-inch double cased well, with the 8-inch seated into the upper portion of the PDC, and the 4-inch seated into the lower portion of the PDC. The well would then be finished open hole in the JDN.

The District Energy well, located several hundred feet to the east of the SMM and next to the Kellogg Avenue bluff penetrated St. Peter Sandstone (STP) at depths between 57 and 95 feet bgs. Knowing that the Minnesota Geological Survey (MGS) was interested in the composition of the basal STP and that the MGS had volunteered to help observe the drilling of the SMM well, we called the MGS and asked them to help out and to gamma log the well if they were interested. We were fortunate to have the geologic expertise (and good company) of Bruce Bloomgren for a few days. For the next four days, Gil Gabanski, Cathy Villas-Horns, and Bruce did a tag team for collecting cuttings and logging the well.

MSP wisely decided to drill down with heavy mud to the desired depth in the PDC before setting any casing. Although debris was encountered in the overburden, the screens installed in the mud tank successfully prevented clogging of the mud pump. We encountered the STP at a depth of 46 feet bgs and set the 8-inch casing into the top of the STP. The STP drilled easily and we encountered the PDC at a depth of 98 feet bgs. The PDC was more challenging and extended to a depth of 235 feet bgs. The borehole was extended into the Jordan to a depth of 243 feet bgs before the casings were grouted in place.

*continued on next page*



*The new well in the Big Back Yard is flowing under artesian pressure. Photo: Gil Gabanski.*

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## The primary objectives of the MGWA are:

- Promote and encourage scientific and public policy aspects of ground water as an information provider;
- Protect public health and safety through continuing education for ground water professionals;
- Establish a common forum for scientists, engineers, planners, educators, attorneys, and other persons concerned with ground water;
- Educate the general public regarding ground water resources; and
- Disseminate information on ground water.

## Science Museum Well, cont.

The 8-inch casing was installed to a depth of 65 feet bgs and the 4-inch casing was installed to a depth of 243 feet bgs in the upper portion of the JDN. The grout was allowed to set over the weekend of January 22-23. So far there was no sign that the ground water would be flowing on its own above the well casing.

The SMM had specifically requested that a flowing well be installed in the BBY so that ground water under artesian conditions could be included as part of the ground water exhibit. While we knew that the vertical heat exchanger loop well had flowed above the ground surface, as well as the District Energy well, no one knew what depth was required to achieve flowing conditions. On Monday, January 24 drilling in the JDN resumed. The drilling was quick and easy, and since we were under budget, we decided to go beyond the 265-foot depth we had included in the bid. Using the last available piece of drill rod, at the site, the well was drilled to a depth of 300 feet bgs in the Jordan.

We all felt pretty good at that point, even though there was no sign that the well would be a flowing well. The drillers started extracting the drill rods from the well. After about half of the rods had been removed, Randy Storms, the lead driller, started to smile the way drillers do when they know something you don't, and he said that he thought there might be water rising in the casing. Sure enough, when the drill rods were nearly out, water started flowing rapidly over the sides of the casing. The well was flowing! We grabbed a 5-gallon bucket and measured the flow at 20 gpm.

Bruce had brought along the vintage MGS van equipped with a gamma logger, and he proceeded to log the well. We then developed the well by air lifting for about four hours to remove more of the sand from the JDN. The drillers cleaned up their equipment and moved out, leaving the well temporarily capped. Even so, some water still flowed out of the well. The next afternoon Nick Schultz of MSP stopped by and successfully installed a device he designed to seal off the well until spring when the pitless adapter will be installed. By then, we plan to have a design of the ground water exhibit.

Folks, we couldn't have done this without your professional and



*The well is capped until spring, when the pitless adapter will be installed. Photo: Cathy Villas-Horns.*

financial support. Thanks especially to MSP and the MGS. On January 24, 2005, Rob Caho, president of the MGWA Foundation, and the rest of the SMM ground water exhibit committee received a letter of thanks from Dr. Eric Jolly, the president of the SMM (see below). Dr. Jolly

thanked the MGWA Foundation for the generous gift of \$20,463 and for the efforts of those of us on the ground water exhibit committee. In addition, in early January 2005 the SMM submitted a \$3 million grant proposal to the National Science Foundation for the development of a traveling exhibit called "Water Planet" which will focus on water's role in large-scale planetary processes on Earth. Ground water will play a significant role in this exhibit, which will include Science-on-a Sphere, a digital river basin and GeoWall II.

The legislature will vote later this spring whether or not to fund the proposal approved by the Legislative Commission on Minnesota Resources last year that will provide additional monies to finish the ground water exhibit and to expand the education of ground water in Minnesota. Stay tuned for the next chapter in the development of this exhibit.



Get fascinated  
January 24, 2005

Mr. Robert Caho  
President  
Minnesota Ground Water Association Foundation  
4779 126th Street North  
White Bear Lake, Minnesota 55110

Dear Mr. Caho:

On behalf of the Science Museum of Minnesota, I want to thank the Foundation for its generous gift of \$20,463 in November 2004. These funds will be invaluable in assisting the Museum with its development of novel ground water education exhibits for its outdoor science park, the Big Back Yard.

The Museum works hard to leverage the resources that organizations such as yours entrust to us. The Museum applied for LCMR funding in February 2004 and the Commission in summer 2004 recommended that the Minnesota State Legislature appropriate \$150,000 to the Museum's ground water education efforts. Assuming that the Legislature follows LCMR's recommendations, the ground water education funding could become available as early as July 2005. Earlier in January, the Museum also submitted a \$3 million grant proposal to the National Science Foundation for the development of a national traveling exhibition (WATER PLANET) about water's roles in large-scale planetary processes on Earth in which ground water will play a significant role.

None of these ground water education efforts would be under consideration were it not for the initiative and continuing efforts of several of your fellow members in the Minnesota Ground Water Association. Chris Elvrum and Cathy Villas-Horns initiated the conversation about ground water education with the Museum three years ago. Mark Ferrey and Gil Gabanski then joined the conversation. Gil and Cathy, in particular, have devoted a tremendous amount of their time and ingenuity to bringing ground water education to fruition here at the Museum.

I look forward to the results of this collaboration between the MGWA Foundation and the Museum. Thanks again for your confidence in the Museum's ground water education efforts.

Yours truly,

Eric J. Jolly, Ph.D.  
President

c.c. Chris Elvrum, Metropolitan Council  
Mark Ferrey, Minnesota Pollution Control Agency  
Gil Gabanski, GJG Environmental Consultants  
Cathy Villas-Horns, Minnesota Department of Agriculture  
Patrick Hamilton, Director of Environmental Sciences and Earth-system Science

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## Question of the Quarter!

The Question of the Quarter is a continuing feature in our newsletter. Each quarter a different question is posed and all members are invited to respond.

### When did the last permafrost disappear from Minnesota?

- Answer:  
A) It's still here  
B) 130 - 170 years BP  
C) 9,000 - 11,000 years BP  
D) 13,000 - 15,000 years BP

Email your answer and your "two cents worth" to:

[newsletter@mgwa.org](mailto:newsletter@mgwa.org)

## MGWA Foundation Passes Public Support Test

Rules for publicly supported and privately supported foundations are different, those for publicly supported foundations being less burdensome. A new foundation can operate for five years under the presumption that it will draw enough support from the public (rather than from a few individuals or companies) to qualify by the end of the period. To make a long story short, the MGWA Foundation completed the five-year period this spring. We had a total of 799 contributors and only two of them contributed more than two percent of the total raised. We passed!

## MGWA Spring Conference

### Ground Water Sustainability Symposium

Our Spring Conference will be held in conjunction with the Geological Society of America (GSA) North Central Section Meeting in Minneapolis May 19, 2005 at the Radisson Metrodome. Registration is through the GSA web site.

### Partial List of Topics (see [www.mgwa.org](http://www.mgwa.org) for more)

Groundwater Sustainability In the Context of General Sustainability, H.-O. Pfannkuch University of Minnesota

Ground Water Availability: An Uncertain Pathway to a Sustainable Future, S. Ragone, NGWA

Water Resources Sustainability: An Ecological Economics Approach, C. Lant, SIU, Carbondale

Water Budgets: The Foundation for Determining Sustainability, T. Winter, US Geological Survey

Climate Change and Ground Water Sustainability, J. Hamilton, Minnetons for an Energy-Efficient Economy

How Can We Sustain Groundwater Quality in Karst and Fractured-Carbonate Aquifers? M. Muldoon, UW - Oshkosh

The Arsenic Special Casing Area in the Fox River Valley of East-Central Wisconsin, B. Brown, WGNHS

Effective Large-Scale Permeability of Multiple Geologic Units, M. O. Saar, University of Minnesota

Mapping Regional Flow Systems in Minnesota with Natural and Anthropogenic Tracers, Jan Faltiesek, DNR - Waters

Natural Tracers as Tools to Address Management Issues Related to Groundwater-Surface Water Interactions, J. Bahr, UW - Madison

Effects of Impervious Surfaces on Ground Water Recharge, T. Winterstein, US Geological Survey

Spatial and Temporal Variability in Ground Water Recharge in Minnesota Using Multiple Methods, G. Delin, US Geological Survey

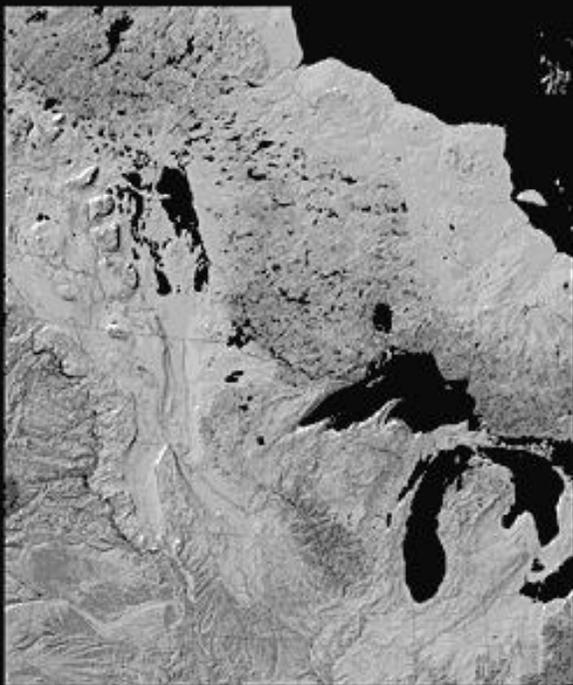
A Surface Water - Ground Water Model to Evaluate Aquifer Sustainability in Washington County, MN, R. Wuolo, Barr Eng.

The Current Use of Groundwater in Southeastern Wisconsin is not Sustainable, K. Bradbury, WGNHS

Sustainable Survival in Context of Hydrologic Trends (or Visa Versa)? Jaroslav Solc, UND EERC

Groundwater Sustainability and Its Application in Kansas, Marios Sophocleous, Kansas Geological Survey

## Geological Society of America



**North-Central Section Meeting**  
Minneapolis, Minnesota  
May 19-20, 2005



**For more information or to register:**  
[www.geosociety.org](http://www.geosociety.org)

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## Capillary Fringe

### “Out-Of-Boundaries” Water Economics

by Lee Trotta

It is not the mission of our ground water organization or this newsletter to cast dispersions on our profession. This article is definitely “out-of-bounds” in that it takes a negative view. As a certified hydrologist for the past 22 years, however, I feel it my duty to put recent developments in perspective. Much of this discussion comes from fellow hydrologists I’ve met in the unemployment line, the rest from newspaper accounts or my own experience.

It is quite depressing to see the profession that we know and love, and worked hard at for many years, become what it is today. Most hydrogeologists now work for consulting firms, which currently provide less opportunity for professional growth than ten to fifteen years ago. Consulting is all about business and making money, not about sound solutions based upon facts and sound technical analysis. Data analysis and solutions implemented are based upon watered-down site investigations and incomplete data analysis. Experienced people can find consulting jobs as long as they can bring in new clients (i.e., steal them from previous employers). Today’s youth, choosing a career in hydrology, can only look forward to half a career. Environmental consulting firms have laid-off knowledgeable and experienced people because they cost more than recent college grads. The age bias is so strong that as soon as young hydrologists are no longer “wet behind the ears”, they may no longer be in the water business. The allowable age-discrimination tactic of “laying off the highest-paid employees” has the effect of throwing specialized scientists into a cutthroat job market where the few job announcements often say “entry level”.

Hydrogeology was a booming field with much opportunity when many decided to pursue that course of study at various branches of the UW in the late 1980s. When they graduated in the early 1990s, there were more jobs than people to fill them. At that time, many people entered the field in pursuit of well-paying jobs, not because of love and passion for hydrogeology. After the LUST bust in the mid 1990s (The Michigan LUST

fund went bellyup in June 1995) and the current recession, our field lost many jobs. Many people left hydrogeology in order to pursue other fields. This should have reduced the competition for those of us who chose to stay. In fact, the viability of many of today’s environmental engineering companies depends on each key change to EPA regulations.

Some in our profession believe that job opportunities will again be plentiful for skilled and experienced people like us. Someday engineering firms, government, industry, and other companies will come to their senses and realize that good technical-based solutions are necessary to solve environmental problems. The watered-down cookbook approaches will then be cast aside, and broad-based professional hydrologists will be essential.

Several trends work against such a joyful prophecy. To list a few: oil speaks louder than water, people are not willing to pay for tap water, and a water scientist gets no respect. What might change in our society to affect these trends? An environment-oriented president might help, but one cannot place the blame for a sluggish economy on one person. “Since Bush assumed office, the U.S. economy has experienced a net loss of 1.2 million jobs, the greatest sustained job loss since the Great Depression” (Michael Rosen, 8-22-2004, Milwaukee Journal Sentinel, p. J-1). Competing Presidential candidates offer nothing in their platforms to address these trends of concern. Concerning oil vs. water, the only company hiring now seems to be Halliburton and the jobs are in Afghanistan or Iraq. Concerning tap water, it’s hard to get municipal water improvements approved even though bottled water sales are good. Concerning the lack of respect for water scientists, this is my own conclusion based on intense

study of thousands of water-related job announcements over the past two years. Respect for the profession we love seems as extinct as the dinosaurs. A hydrologist’s resume, that used to draw competition from Fortune 500 companies and government agencies, seems worthless. Water expertise is now shunted aside in favor of skill in building bridges and highways.

In reality, hydrogeology is on a downward spiral and today’s growth industries find our degrees quite useless. The good news is that with the knowledge of man and nature we have gained in our profession, just about any other job is a piece of cake. However, compensation for most available jobs in health care or the service industry is far below what we’re used to. Many of these jobs are only offered on a part-time basis. “If one adds the nation’s 5.5 million who want to work full-time but can only find part-time jobs, the underemployment rate is a startling 10.5% and still excludes another one million workers who have vanished from the labor market altogether” (Michael Rosen, 8-22-2004, Milwaukee Journal Sentinel, p. J-1). If you have a job in hydrology, hold on to it tightly. Otherwise, look into getting certified as a nurse or accountant. “Both sides of the philosophical divide (Democrats vs. Republicans) seem to agree that the rise in long-term unemployment is signaling an economic restructuring, as a result of which many old jobs won’t return. What’s sorely missing are policies to support workers, who make up America’s backbone, during this shift” (Milwaukee Journal Sentinel editorial, 9-29-04, p. 16A).

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*Editor’s note: Lee Trotta was the MGWA Newsletter editor 1987 - 1990s.*



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## Sewer Tunneling Machine Drills through Abandoned Well 90 Feet Beneath the Surface in Woodbury, Minnesota

*By Minnesota Department of Health, Well Management Section.*

In February 2004, a representative from the Metropolitan Council notified the Minnesota Department of Health (MDH), Well Management Section, that the Metropolitan Council's sewer tunneling contractor may have drilled through an old abandoned farm well in Woodbury, Minnesota, while drilling a horizontal sewer tunnel shaft 90 feet beneath the land surface. The tunneling drill operator reported drilling up pieces of wooden planks, steel rod, and small diameter steel pipe (Figure 1). The contractor had been constructing a new 72-inch diameter sewer tunnel to connect the city of Woodbury with the new, expanded sewage treatment plant in Cottage Grove, Minnesota. The abandoned well had not been used since the 1960's and was likely buried underneath a road ditch during road reconstruction in the late 1960s. The MDH inspected the site, and based on the reports from the drill operator, it appeared that the well might have been an old, hand-dug well that was curbed with wooden planks.

In June 2004, the tunneling contractor obtained a 1960 county highway map for the area that showed a pump house on the property. The contractor used this map to help identify the location of the old well. The contractor excavated a large area in the road ditch adjacent to a buried gas main pipe but did not initially find the well. A second attempt to locate the well was made several weeks later. This time, a 5-inch diameter steel well casing was found bent over and buried 10 feet beneath the surface (Figure 2). The contractor continued excavating to a depth of approximately 15 feet below the land surface to determine if the 5-inch casing was inside a hand-dug well with wood curbing. Wood curbing was not found at the surface; however, the area immediately surrounding the 5-inch casing appeared to have been filled with clay. The natural soil surrounding the clay was sand and gravel.

The tunneling contractor hired Traut Well Company to investigate and seal the well. Traut measured the well and found it to be open to a depth of approximately 80 feet where it encountered the top of the sewer tunnel. Traut Well Company proceeded to seal the upper 80 feet of the well with neat-cement grout.

The sewer tunnel was constructed on top of the bedrock surface, which is St. Peter Sandstone in the area. The static water level in the area is 90-100 feet below the land surface. Based on the static water level information, and the fact that a pump cylinder was not retrieved when the tunneling drill advanced through the well, the MDH believed that it was likely that the well extended beyond the bottom of the tunnel.

The MDH required that the search continue for the rest of the well beneath the tunnel. This required entry into the sewer tunnel. The closest tunnel drop shaft was one mile away. Staff from the Metropolitan Council, MDH, Traut Well Company, and the sewer contractor were lowered by a crane down a 90-foot deep drop shaft, and then took a one-mile electric train car ride inside the tunnel to the approximate location of the well. Using measurements from an air shaft at the surface, and a metal detector, the approximate location of the well was marked. The tunneling contractor used an electric chainsaw to remove several timbers from the base of the tunnel framework to search for the well (Figure 3). After digging through some St. Peter Sandstone, wooden planks arranged in a square were located. Inside wooden planks, a 5-inch diameter well casing was found surrounded with clay. The well casing was cleaned out to a depth of 127 feet. Traut Well Company permanently sealed the remainder of the 5-inch well with neat-cement grout on June 24, 2004 (Figure 4).

It appears that the original well was a hand-dug well curbed with wood planks to a depth of at least 90 feet. The well likely obtained water from the St. Peter aquifer. At some later date, the hand dug well likely went dry. In an effort to deepen the well, a 5-inch diameter steel cased well was drilled inside the hand dug well. The annular space surrounding the 5-inch casing inside the wood curbing was then apparently filled with clay to eliminate the possibility that someone might fall down the hand-dug portion of the well.



*Figure 1. Pieces of wooden planking, drop pipe, and stroke pump rods.*



*Figure 2. The old, unsealed well is found in the road ditch.*



*Figure 3. Cutting through the sewer tunnel planking to search for the well.*



*Figure 4. Sealing the abandoned well beneath the sewer tunnel.*

## Areas Designated Sensitive to Class 5 Automotive Fluid Waste Disposal Wells

By Bruce Olsen, Minnesota Department of Health

The Minnesota Department of Health (MDH) is the lead agency for protecting public health and administers state and federal regulations that affect the wellhead protection program. The United States Environmental Protection Agency (EPA) is responsible for administering federal underground injection control regulations in Minnesota. Together, the two agencies have developed a protocol for assessing where Class 5 automotive waste disposal wells present a threat to underground sources of drinking water.

### Class 5 Automotive Waste Disposal Wells

The term "Class 5" refers to a broad category of disposal wells defined under federal regulations. Structures such as the drain fields for septic systems, dry wells, and underground gravel pockets that dispose of fluids used by internal combustion engines are identified as automotive waste disposal wells. Fluids include hydraulic fluid, antifreeze, grease, oil, gasoline, diesel fuel, brake fluid, and transmission fluid. The construction of new Class 5 automotive fluid waste disposal wells is not allowed under either federal or state regulations. Existing wells are not allowed in 1) the wellhead protection areas for public water supply wells or in 2) other sensitive areas.

MDH staff developed county-scale maps showing areas where Class 5 automotive waste disposal wells are likely to present a threat to underground sources of drinking water

based on geological conditions. The purpose for doing this is to help local, state, and federal agencies identify priority areas for inventorying these types of underground injection wells and to ensure that, where required, they are properly sealed according to practices specified by the EPA.

The level of detail that can be shown on the maps is limited to the mapping scale. Therefore, there may be small-sized areas that are not sensitive but are too small to be shown. Here, site-specific information should be used to make the sensitivity evaluation. An example map (Anoka County) is shown on the following page.

### Methodology for Identifying Sensitive and Non-sensitive Areas

A copy of the document called Designating Areas Sensitive to Class 5 Motor Vehicle Waste Disposal Wells can be obtained from either the MDH or the EPA. It defines the subsurface geological conditions that must be present in order to reduce the potential risk that a Class 5 motor vehicle waste disposal well presents to underground sources of drinking water. In addition, the document describes the methodology for preparing a sensitivity map using 1) site-specific data such as drilling logs or records of bedrock outcroppings and 2) interpretations of geologic conditions obtained from geologic maps and reports.

The mapping process is presented as a series of steps that is performed using a geographic information system. Once the initial map has been generated, additional interpretation is sometimes needed because highly variable localized conditions may cause conflicting mapping results. Here, the experience of a qualified geologist is needed to sort out mapping discrepancies and to complete the sensitivity map.

**Step 1: Identify areas where clay-rich glacial deposits may occur just beneath the land surface.** The principal source for this information is the statewide coverage of landforms that was developed by the Minnesota Geological

Survey (MGS) and the Geology Department at the University of Minnesota at Duluth. Areas where till and superglacial deposits occur are the sediment assemblages selected to broadly define where clay-rich glacial sediments may occur within 30 feet of the land surface. These areas can be further defined by referencing the more detailed mapping of glacial sediments contained in the County Geologic Atlas Series or Regional Hydrologic Assessment Series that have been prepared by the DNR & MGS. Also, county soil surveys are useful for identifying whether clay-rich materials form the parent materials for the soil classifications used to prepare soil maps. In some areas, lacustrine deposits may be included following a determination whether they are clay-rich or contain a significant component of sand and silt.

**Step 2: Assemble data describing 1) where the depth to bedrock is less than 30 feet, 2) the locations of sinkholes, and 3) exposures of bedrock.** These features are not present in all counties, but introduce a much more complicated set of geologic conditions where they occur. The data sources used to determine whether any of these features are present are 1) the County Well Index database, 2) the statewide coverage of karst features, and 3) maps showing exposures of bedrock.

Using the data sources listed, a map is prepared to show the areas where the depth to bedrock is less than or greater than 30 feet. It is assumed that the capabilities for clay-rich glacial deposits to reduce contaminant risk from Class 5 automotive waste disposal wells are greatly diminished where bedrock occurs within 30 feet of the land surface. Therefore, these areas are considered to be sensitive.

**Step 3: Identify the thickness of clay-rich glacial deposits that occur between 10 and 30 feet of the land surface.** The methodology for determining where non-sensitive areas occur excludes any geologic materials that occur within 10 feet of the land surface because they are likely to be 1) fractured by frost and weathering, 2) disturbed by the construction of the Class 5 well, and 3) disturbed by plant roots and animal burrows. Therefore, this depth interval is not included because it is likely that the integrity of any clay-rich materials has been diminished.

Water well logs and test hole records are used to identify the geological

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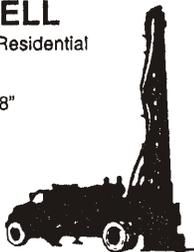
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## Class V Automotive Well Sensitivity Mapping for Anoka County, Minnesota

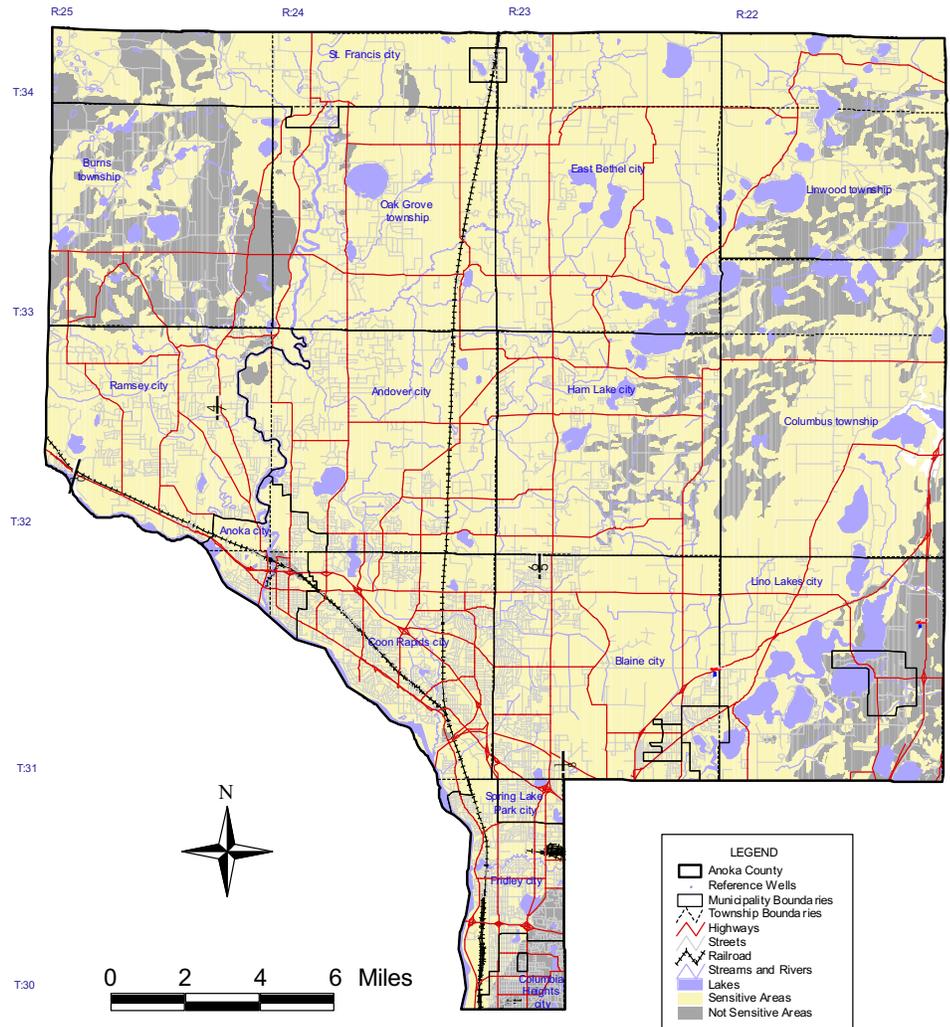
materials that are present for the depth intervals of 10-20 and 20-30 feet below the land surface. A geologist needs to classify (or standardize) the many terms used by drillers to reflect clay-rich materials. The standardized classifications are used in a statistical determination that results in a map showing the probability that clay-rich conditions will occur.

Extrapolating between data points introduces uncertainty into the resulting probability map because of 1) the distribution of data points is often not uniform and 2) the detail describing geologic conditions in well logs varies between drilling contractors. For example, a drilling record may indicate that the thickness of glacial deposits is greater than 30 feet but the glacial deposits were lumped into a common term called "glacial drift". This record was useful for determining the depth to bedrock for step 2 but is too general to be included in this step.

The final results of this step are 1) a collection of data points that indicate the cumulative thickness of clay-rich glacial deposits that occur at depths of 10 to 30 feet below the land surface and 2) a map showing the probability that clay-rich deposits occur at the same depth interval.

**Step 4: Integrate the Results of the First Three Steps to Prepare the Initial Sensitivity Map.** Areas where clay-rich glacial deposits occur (Step 1) are referenced to the depth to bedrock and local bedrock conditions (Step 2). The resulting map indicates the areas where clay-rich deposits should be at least 30 feet thick. Areas where these conditions are not present are considered to be sensitive to Class 5 automotive waste disposal wells.

Next, the remaining areas are referenced to the data points representing the cumulative thickness of clay-rich deposits that occur from 10 to 30 feet. Ideally, this thickness should be 20 feet, but small lenses of sand or gravel may occur within otherwise, clay-rich glacial deposits. These localized conditions should have little impact on the overall evaluation of the 10 to 30 foot interval where nearby data points indicate the full 20 feet consist of clay-rich materials. Therefore, the Minnesota Department of Health uses the probability evaluation to define areas where there is an 80% or greater probability that clay-rich deposits will occur within the 10 to 30 foot depth interval.



**Step 5: Reference Site-Specific Data to Confirm Mapping Results.** A geographic information system is used to reduce the time required to integrate the maps and data sets that are used to compile a sensitivity map. As a result, extrapolating between data points or overlaying and combining maps may introduce uncertainty into the final results, especially where subsurface geological conditions are variable. Therefore, a geologist must reference the final results to the initial point-source data and determine whether any changes are warranted to reflect any discrepancies that occur. Areas are removed from consideration as non-sensitive where point-source data conflicts with the interpreted mapping results.

### Using the Maps

Class 5 automotive waste disposal wells are most likely to impact an underground source of drinking water in sensitive areas and in those areas EPA will require that they be properly closed. Also, they must be properly closed if they are located within a well-head protection area that is approved by the Minnesota Department of Health. Maps of areas sensitive to Class 5 motor vehicle waste disposal wells have been produced for all but 8 Minnesota counties and are currently being reviewed at EPA. After its review is complete, MDH intends to post the maps on its website. Please contact wellhead protection program staff at 1-800-818-9318 or visit their web site at [www.health.state.mn.us/divs/eh/water/swp/index.htm](http://www.health.state.mn.us/divs/eh/water/swp/index.htm).

## The Minnesota Ground Water Bibliography Lives Again

Thanks to an inter-agency cooperative effort, the Minnesota Ground Water Bibliography is available online as a PDF document. Originally published in 1990 by the Minnesota Department of Natural Resources (DNR), the 117-page bibliography was updated, scanned, converted to a text document, and finally turned into a PDF by Minnesota Pollution Control Agency staff. The PDF file is posted on the DNR web site at [www.dnr.state.mn.us/publications/waters/index.html#GWBibliography](http://www.dnr.state.mn.us/publications/waters/index.html#GWBibliography).

The entries in the bibliography are organized geographically by DNR region and by subjects such as "Agriculture", "Climate", "Forestry", "Geology", etc. The bibliography is a complement to the Minnesota Ground-Water Information Resources Guide, [www.mgwa.org/gwguide.html](http://www.mgwa.org/gwguide.html), which tends to focus more on recent publications that are available directly on the Internet.

## Ramsey County Geologic Atlas PDFs available online

Recently, the Minnesota Geological Survey scanned the 10 plates of the 1992 Ramsey County Geologic Atlas and converted the files to PDF format. The files are posted on the MGS ftp site at <ftp://156.98.153.1/pub3/c-7/>. Available GIS coverages are also posted at the same location. Scanning and posting of PDF files for the Hennepin and Scott County Geologic atlases are underway. An example clip from a scanned map is shown at right.

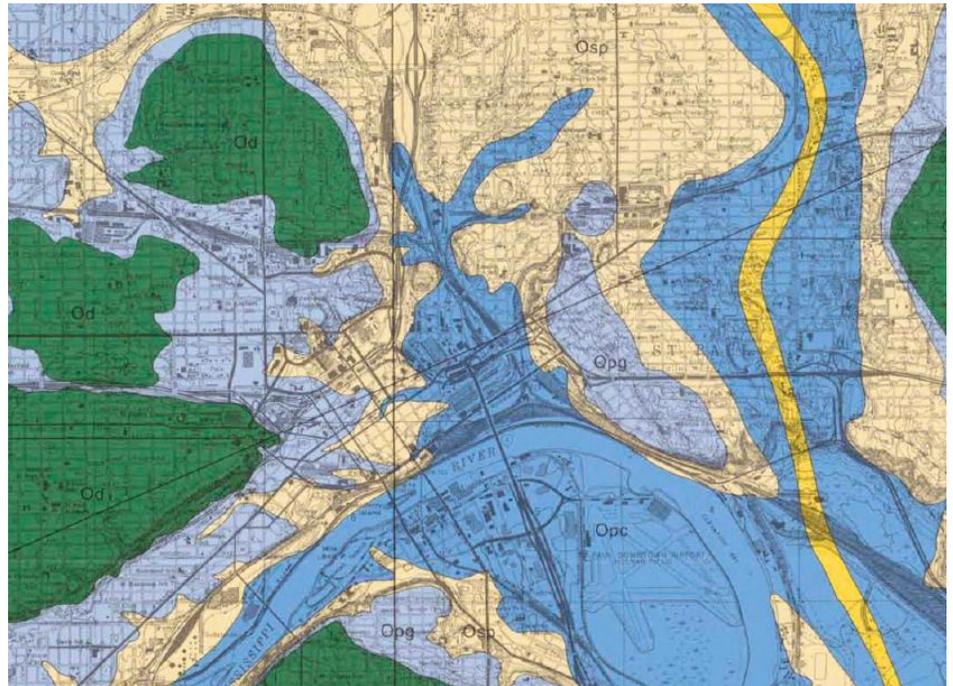
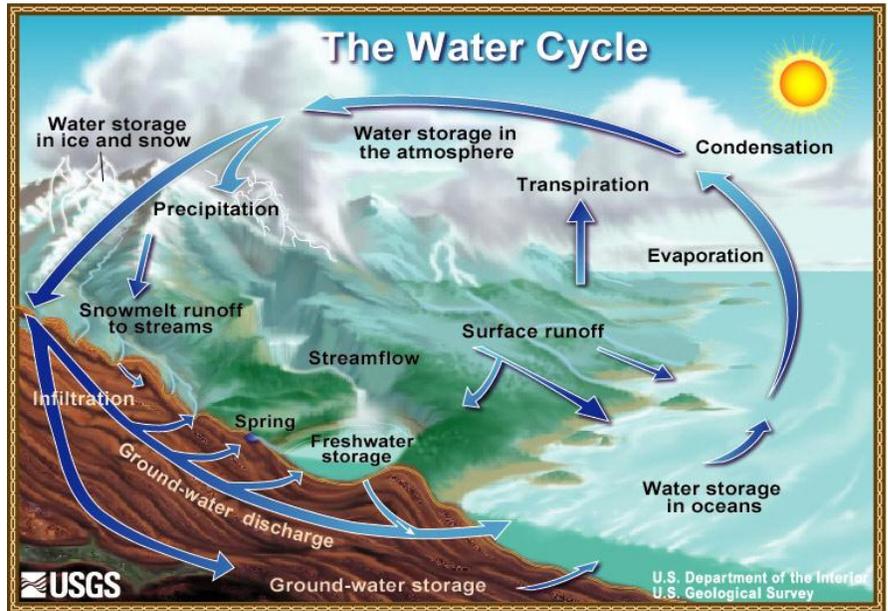
Since the publication of county geologic atlas or regional hydrogeologic assessment series reports in the metro area, the MGS has published some newer surficial geologic maps for those areas at 1:100,000 or greater. Those more recent products, offered as both PDF files and GIS coverages, are listed in the MGS's current publications list at [www.geo.umn.edu/mgs/currentpubs.pdf](http://www.geo.umn.edu/mgs/currentpubs.pdf).

For more information contact the MGS at 612-627-4780.

## The Hydrologic Cycle - New USGS Web Site

The U.S. Geological Survey has posted a new web site featuring the hydrologic cycle. Although it is a subset of their "Water Science for Schools" web site, it includes enough detail to be of interest to water professionals. The site is a comprehensive resource about the hydrologic cycle, and offers the option of seeing a diagram of the hydrologic cycle in 54 different languages. Examples in English and Lao are reproduced below.

To check it out, go to [ga.water.usgs.gov/edu/watercycle.html](http://ga.water.usgs.gov/edu/watercycle.html). The Water Science for Schools site is found at [ga.water.usgs.gov/edu/index.html](http://ga.water.usgs.gov/edu/index.html).



Example clip from one of the scanned maps from the Ramsey County Geologic Atlas now available online from the MGS ftp site.

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## Tiny Devices for Logging Temperature

Temperature monitoring is less intrusive, cheaper, and easy with thermochrons. Thermochrons are an entire temperature logging system sealed within a stainless case "the size of 5 dimes". The low-cost devices can measure temperatures as low as -40 C. In Minnesota water bodies, the devices have been used without failure in shallow underwater locations for many months.

Thermochrons are made and distributed by Maxim-Dallas: [www.maxim-ic.com/products/ibutton/](http://www.maxim-ic.com/products/ibutton/). Inside the device are a temperature sensor, an analog-to-digital converter, a clock, thousands of memory locations, input-output circuitry, and a lithium battery. According to company literature, the battery should last for one million readings or up to 10 years. Since everything is sealed within the stainless steel case, the unit must be replaced when the battery dies.

The devices are as inexpensive as \$16 each in lots of 100 or more. Cabling to connect the devices to a computer serial port (about \$40) is required to download data from the device's storage. Software for PCs to program and read the devices can be downloaded FREE from the company website. Additional cabling and for-fee software is required to read/program the devices with a PDA.



The Snow Rules! project, [climate.umn.edu/SnowRules/SnowRules.htm](http://climate.umn.edu/SnowRules/SnowRules.htm) of the Minnesota State Climatology Office uses thermochrons to log air and shallow water temperatures in northeastern Minnesota.

Contributed by Jim Zandlo, [jzandlo@umn.edu](mailto:jzandlo@umn.edu), Minnesota State Climatology Office, DNR Waters

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## Minnesota's Forum of Women in the Environmental Field

Contributed by Suzy Mellem, Chair, Forum of Women in the Environmental Field

The Forum of Women in the Environmental Field provides an opportunity for women to network with various professionals in the environmental field and to hear about current environmental issues. The Forum membership includes hydrogeologists, geologists, biologists, ecologists, lawyers, engineers and other professionals doing environmental work. The Forum sponsors six events a year on a wide range of environmental topics. Recent topics have included sustainable agriculture, green buildings, the ecology of Madagascar, and a political panel discussing how the outcome of the elections would affect the environment. Speakers are drawn from a pool of local and national figures working in a variety of environmentally related fields.

The Forum's March 23rd event will be a tour of the State Capitol and an informal discussion with new legislators and their environmental work. The meeting will be held from 11:30 a.m. to 1 p.m. and include lunch. May's meeting will be the annual networking meeting focusing on "finding a job in the environmental field." The remainder of 2005 will focus on urban sprawl, a science-related topic, and a political panel. Men are welcome to attend events. To register for an event or become a member of the Forum, contact the Forum Chair Suzy Mellem at (612) 624-5119 or see the Forum's Web site at [www.fwef.org](http://www.fwef.org).

MGWA Newsletter, March 2005

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## Continuing Education Opportunities

The MGWA Web site has a section called "Calendar" that lists upcoming conferences and links to other web sites for educational opportunities. If you are interested in obtaining continuing education credits for driller or Professional Geoscientist licensure renewal, this is a good source of information.

The Board of Architecture, Engineering, Land Surveying, Landscape Architecture, Geoscience and Interior Design does not pre-approve continuing education credits for conferences or workshops. You can assess whether a conference should qualify for credit by using the guidance found at [www.aelslagid.state.mn.us/ceform.pdf](http://www.aelslagid.state.mn.us/ceform.pdf)

If you are aware of a conference or workshop that is not on the calendar or to be found among its links, please contact MGWA at (651) 276-8208 or send an email to [office@mgwa.org](mailto:office@mgwa.org).

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## State's Ten-Year Water Quality Monitoring Strategy

Minnesota's Water Quality Monitoring Strategy describes a 10-year plan for surface and ground water monitoring. Prepared by the Minnesota Pollution Control Agency, the plan includes information on several types of monitoring, including condition, problem investigation, and effectiveness monitoring. Under the plan, Minnesota will completely assess its lakes and streams on a ten-year cycle and will re-establish its ground water monitoring network in cooperation with the Minnesota Departments of Agriculture and Health. Minnesota's strategy was accepted by the U. S. Environmental Protection Agency in

September 2004. Details of the plan can be found at:

[www.pca.state.mn.us/water/pubs/wqms-report.html](http://www.pca.state.mn.us/water/pubs/wqms-report.html).

Three Minnesota State Agencies, the Departments of Agriculture and Health, and the Minnesota Pollution Control Agency, have developed a joint plan for conducting ground water quality monitoring statewide. The joint plan recognizes the Agencies' differing purposes, goals and roles in ground water quality monitoring based on their respective state and federal requirements, while establishing an integrated monitoring system. The complete agreement, signed by the commissioners of the three agencies, may be found at:

[www.pca.state.mn.us/water/groundwater/gwqm-agreement.html](http://www.pca.state.mn.us/water/groundwater/gwqm-agreement.html)

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## Minnesota Board of Water and Soil Resources (BWSR) Headquarters Has Moved

As of February 22, 2005, BWSR has moved its St. Paul headquarters office north across the Mississippi River to the second floor of 520 Lafayette Road, St. Paul, MN 55155. BWSR now shares office space with the Pollution Control Agency and is next door to the Department of Natural Resources. BWSR staff phone numbers are unchanged. Complete details, including a map and parking information, may be found on the BWSR web site:

[www.bwsr.state.mn.us](http://www.bwsr.state.mn.us)

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## MGWA Member News

**Paul Putzier**, a former MGWA board member, has taken a new position with STS Consultants as Department Manager and Senior Hydrogeologist. STS provides a wide range of engineering and environmental consulting services to industry, municipalities and the state of Minnesota. The company provides turnkey services for development of impaired properties, including remediation, regulatory negotiations and site development. Paul will be a part of the STS team bringing impaired properties back into productive use. Paul can be reached at (763)315-6304, or by email at [putzier@stsconsultants.com](mailto:putzier@stsconsultants.com).



*Paul Putzier, STS Consultants*

**David Richardson**, PG, PE, has taken a civil engineering position at the Minneapolis office of Geomatrix Consultants, Inc. Previously, David spent 14 years as a geologist/civil engineer at ARCADIS (fka Geraghty & Miller) and 2 years with the North Dakota State Department of Health. At Geomatrix, David is working in multiple business practices including Environmental Health and Safety compliance, storm water pollution prevention, Spill Prevention Control and Countermeasures, Phase I/II Environmental Site Assessments, and remedial investigation/design/implementation. David also helped coordinate a financial contribution from Geomatrix to his alma mater, the University of Minnesota-Morris, for the Doc Rock Fund. The fund was established to help defray field camp costs for UMM geology students. David and his wife Kath have two kids, Alura (age 13) and Alex (age 9). Contact David at [d Richardson@geomatrix.com](mailto:d Richardson@geomatrix.com) or (952)935-1010.

**John Seaberg**, PG, CGWP, recently accepted a position at Natural Resource Group, Inc. (NRG), a Minneapolis-based environmental consulting firm with offices in Houston, Denver, Providence, and Anchorage. At NRG, John conducts site investigations and ground water modeling, provides hydrogeologic oversight and technical support to remediation projects, and oversees related marketing efforts. Prior to joining NRG, John was a

hydrogeologist for over 14 years at the Minnesota Pollution Control Agency (MPCA), where he provided technical oversight to state and federal Superfund sites; led the development of the Twin Cities Metropolitan Area Groundwater Model; and managed the development of the Environmental Data Access Website. Prior to working at the MPCA, he spent five years working in consulting on mostly ground water remedial investigation and cleanup projects. He has experience in characterization of hydrogeology and flow systems, field investigation programs, and ground water modeling. He also periodically provides instruction for Strack Consulting, Inc.'s short course entitled "Application of Computer Models to Groundwater Problems Using the Analytic Element Method". Contact John at [jseaberg@nrginc.com](mailto:jseaberg@nrginc.com) or (612)347-6796

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## MGWA Thanks its Corporate Members

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## MGWA Advertising Opportunities

MGWA can place your ad in several ways: in the newsletter (quarterly), in the directory (annual, with periodic updates) on our web page, and through e-mailing to MGWA members. Two of the less-well-known options are:

**Classified ads:** Classified ads in the newsletter are charged at the rate of \$3 per 45 characters (including spaces and punctuation) per newsletter issue.

**E-mail notices:** A one-time e-mailing to the membership costs \$10 for an individual (e.g., seeking a job), and \$50 for an organization (e.g., announcing a new product, job opening etc.). A 200 word limit is imposed. The advantage of e-mail is the speed of dissemination.

The Advertising Manager has final determination on the acceptance of materials submitted. Direct your orders and questions concerning advertising rates and policy to: Jim Aiken, Advertising Manager, c/o MGWA, 4779 126th Street, White Bear Lake MN 55110-5910; Phone (952)470-0983.

## Corporate Membership Rates

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Please make checks payable to "Minnesota Ground Water Association" or "MGWA." Direct your orders and questions concerning corporate memberships and policy to the Advertising Manager: Jim Aiken, MGWA Advertising Manager, c/o MGWA, 4779 126 St N, White Bear Lake MN 55110; Email [jaiken@mccainassociates.com](mailto:jaiken@mccainassociates.com).



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## “Nature’s Laboratory”: The Virtues of Antebellum Groundwater

By Greg A. Brick

This entertainingly hyperbolic description of Chalybeate Springs, in Minneapolis, comes from Frank G. O'Brien's *Minnesota Pioneer Sketches*, published in 1904. A complete copy of the book can be found on-line at the Library of Congress website: [memory.loc.gov/ammem/umhtml/umhome.html](http://memory.loc.gov/ammem/umhtml/umhome.html). Not only do the springs still exist, flowing as lustily as ever on the riverbanks in Pillsbury Park, but there are in fact seven of them (depending how you count), rather than just the two mentioned by O'Brien. The springs also live up to their name “Chalybeate,” meaning iron-bearing, as you may observe from the rust-stained soil and vegetation at their exit points. By 1889, however, the springs had lost much of their cachet, as indicated by newspaper commentary of the day. Calvin Alexander, University of Minnesota, has analyzed the waters and conducts University of Minnesota ground water field trips to the springs. I will have more to say about Chalybeate Springs in future columns.

*Stopping the other day to quench my thirst at Donaldson's ever-flowing fountain of water “sparkling and bright” my mind reverted to the Chalybeate Springs which were not the least of many attractions in this locality forty-odd years ago, and I was led to inquire: “What has become of them?” Many of the old residents will readily recall this Mecca to which thousands of invalids made pilgrimage in those early times to drink of the water and be healed of whatever disease they had. These springs were said to contain all the properties necessary to restore the physical system to its normal condition; were, in fact, a veritable “elixir of life.” So certain were scientists of this that chemical analysis was made, and so satisfactory was the result, that circulars were printed and scattered broadcast all through the Eastern and Southern states. Such a furore was created that invalids flocked hither from far and near, more especially from the South.*

*The rush was so great that our hotel capacity was inadequate to accommodate the visitors with any degree of comfort, notwithstanding the fact that there were several good-sized hotels which would be a credit to us even at the present time. Among those were the Jarrett House, St. Charles Hotel and American House, all located on the East Side and conveniently near the springs.*

*The necessity for additional places where strangers could be entertained, induced J. M. Winslow to erect the (at that time) magnificent hotel known as the Winslow House, which was demolished not many years ago to make room for the Exposition Building (now The International Auditorium) which occupies its site.*

*Previous to the war the Winslow House was crowded to its fullest capacity, not alone by those who had ailments, but by the wealth and fashion of the South who came hither to escape the heated term and breathe in our Northern ozone, and drink of the water that flowed so freely from the ambushed springs on the river bank.*

*All day long, during the months of June, July and August, could be seen ladies, old and young, plainly dressed and accompanied by their colored servants and nurses, each with goblet or drinking-cup of some description in hand, wending their way to the springs to invigorate their torpid livers with the impregnation of iron, magnesia and sulphur, as it oozed out of the reservoir in Nature's laboratory.*

*These springs—there were two of them—were located on the left bank of the Mississippi, directly opposite Cross, Pillsbury & Co.'s hardware store, a short distance below where Pillsbury “A” mill now stands. The city fathers paid considerable attention to making the place attractive. Steps were constructed and a long promenade walk reaching from one spring to the other; comfortable benches were provided where the weary might rest “between drinks” and view the panorama spread out before them. Near by were the East Side Falls and the rushing current below, while farther away*

*continued page 16*



*Chalybeate Springs, Minneapolis, circa 1875.*



*Chalybeate Springs, winter 1992.*

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## MESTA Listserver Up and Running Again

A listserv that serves over 300 earth science teachers and geologists throughout Minnesota is again available to promote communication between earth science teachers and others interested in Minnesota earth science education. The list is maintained by Lee Schmitt at Hamline University ([lschmitt@hamline.edu](mailto:lschmitt@hamline.edu)).

To subscribe send an e-mail to: [listproc@listproc.hamline.edu](mailto:listproc@listproc.hamline.edu). Leave the subject line blank. In the body of the e-mail type: subscribe MESTA Your Name. Then click send. Make sure there are no signatures or attachments in the body of the e-mail. A confirmation e-mail will be sent. E-mails you send to [MESTA@listproc.hamline.edu](mailto:MESTA@listproc.hamline.edu) will then go to everyone on the list.



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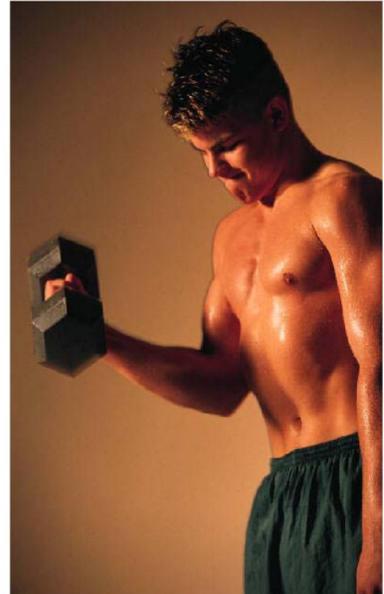
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## Join the Minnesota Ground Water Association!

2005 dues are \$25 for professional members and \$15 for students until 8/1/2005. Members are entitled to subscribe to the paper version of the newsletter for \$10/yr, the electronic version is available on the website for members at no additional charge. Members are also entitled to purchase a paper copy of the annual membership directory for \$7; an electronic version is available on the website for paid members at no additional charge. Additional donations to the MGWA Foundation will be gratefully accepted. Dues paid to MGWA are **not** deductible as charitable contributions for federal income tax purposes. However, dues payments are deductible as ordinary and necessary business expenses to the extent allowed by law. The MGWA Foundation is a 501(c)3 non-profit and donations to it **are** deductible as charitable contributions.

Just complete the form below and mail to: MGWA, c/o WRI, 4779 126th St. N, White Bear Lake, MN 55110-5910. Or you may choose to enroll online at [www.mgwa.org](http://www.mgwa.org)

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Name \_\_\_\_\_ Full-Time Student? \_\_\_\_\_

Affiliation/Employer \_\_\_\_\_

**Work Address** \_\_\_\_\_

City, State, Zip Code \_\_\_\_\_

Work Telephone Number \_\_\_\_\_ E-mail \_\_\_\_\_

Fax Number \_\_\_\_\_

**Home Address** \_\_\_\_\_

City, State, Zip Code \_\_\_\_\_

Home Telephone Number \_\_\_\_\_

Which Telephone Number should we use for Directory Listing? \_\_\_\_\_

Please indicate if you want to have the Directory (\$7) \_\_\_\_\_ or Newsletter (\$10) mailed to you \_\_\_\_\_

## Ground Water History: Chalybeate Springs, cont.

*was the sparsely settled West Side, the picturesque beauty of whose Falls had not been desecrated, to any great extent, by the hand of man.*

*From this point could be seen the dilapidated old government mills, now the site of the Sidle, Fletcher & Holmes mill, and Spirit Island, which was quite generally believed to be haunted by the spirits of the departed braves who formerly inhabited this region. It was this, indeed, that gave the island its name, and clairvoyants were ready to vouch for the propriety of the name and also the belief of the people. We of less imaginative turn of mind attribute this illusion to the effect of the water, or fancied it the result of raising the flask at too high an angle.*

*This promenade at the springs was arched with wild grapevines, making a complete bower, secluded and fascinating.*

*We were at a loss in those days to keep track of the hour—or more correctly the minute—of the day. No two watches or clocks were alike, for we were not blessed with telegraph communication with the outside world; we were therefore, obliged to guess at the time and set our watches by the guess. This was so unsatisfactory that several public-spirited citizens united and sent east and procured a copper sun-dial, which was placed on a pedestal near the approach leading to the Springs. Evidently it was supposed that all in possession of a watch would visit the place for a drink and at the same time see that they were in line with the shadow. It was not an uncommon thing to find fifteen or twenty at a time setting their watches by the dial. Its days of uselessness—or perhaps we should say usefulness—were soon over, as it was stolen by some miscreant with the evident intention of melting it into copper, since he could see no sense (cents) in it while in that particular form.*

*As we polish up our dial of the past we are able to trace the shadow and can also catch the rays of sunshine that have come to us through the rifts in the clouds; revealing the fact that it is past noon, and the bright rim of the western horizon is rapidly coming into view.*

*Somewhere undoubtedly, the springs continue their flow as of yore, but what has become of the patrons of their palmy days? We listen, but our only answer is the echo of our questioning.*

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## Minnesota Department of Agriculture's "What's in My Neighborhood?" for Agricultural Incidents

This is a web-based searchable inventory of properties in Minnesota contaminated with agricultural chemicals. The inventory includes properties that have already been investigated and cleaned up, as well as those currently enrolled in Minnesota Department of Agriculture (MDA) cleanup programs. The map-based interactive application is accessible through [www.mda.state.mn.us/incidentresponse/neighborhood.htm](http://www.mda.state.mn.us/incidentresponse/neighborhood.htm).

The MDA is the lead agency for response to, and cleanup of agricultural chemical contamination in Minnesota. Because of this role MDA has tracked spills of agricultural

chemicals and sites contaminated with agricultural chemicals since the late 1970's. For the purpose of mapping these incidents MDA has grouped them into three categories 1. Old Emergencies, 2. Small Spills and Investigations, and 3. Investigations Boundaries. MDA has also made available information relating to any investigations that have been closed with soil or ground water contingencies or restrictions attached to them. In the future, MDA plans to add additional search capabilities to the site and also polygon data for approximately 550 abandoned agricultural-chemical facilities that were inventoried in 2004. For more information, contact Gary Elsner at [gary.elsner@state.mn.us](mailto:gary.elsner@state.mn.us) or (651) 297-7268.

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## Upcoming Conferences and Training

Minnesota Onsite Wastewater Conference, March 21-22, 2005, Duluth Entertainment and Convention Center, Duluth, Minnesota, contact: [www.mostca.com](http://www.mostca.com)

Redoximorphic Features in Soils Symposium, March 23, 2005, Duluth Entertainment and Convention Center, Duluth, Minnesota, contact: [www.mostca.com](http://www.mostca.com)

Aggregate Mining Conference, March 30-31, 2005, St. Cloud Civic Center, contact: Mid-Minnesota Development Commission, 320-235-8504 ext. 24.

April 5, 2005, American Institute of Professional Geologists, Minnesota Section (AIPG-MN), AIPG Luncheon Presentation: Search for Diamonds (and Gold?) in Minnesota, Presenter: Harvey Thorleifson, Minnesota Geological Survey, 11:45 a.m., Kelly Inn, I-94 and Marion Street, St. Paul, Minnesota, Contact: Audrey Van Cleve 651-227-6500, ext. 3111

51st Midwest Friends of the Pleistocene Field Conference: May 13-15, 2005, Streator, Illinois, contact: Illinois State Geological Survey, 217-333-5105.

MGWA Spring Conference, May 19, 2005, held in conjunction with GSA North-Central Section Annual Meeting May 19-20, 2005, Radisson Metrodome, Minneapolis, contact: Laurel Reeves, [laurel.reeves@dnr.state.mn.us](mailto:laurel.reeves@dnr.state.mn.us)

Geological Society of America, North-Central Section, Annual Meeting, May 19-20, 2005, Radisson Metrodome, Minneapolis, contact: [www.geosociety.org](http://www.geosociety.org)

Land Development & Water Law, May 26, 2005, Mendakota Country Club, Mendota Heights, Minnesota, contact: [www.clarionlegal.com](http://www.clarionlegal.com)

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## Web Page Volunteer?

We'd like our web page to be more attractive, but our current efforts need to be directed more to content than appearance until we can find some additional help. Please contact the editor at [newsletter@mgwa.org](mailto:newsletter@mgwa.org) if you would be willing to assist with this project.

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## Minnesota Ground Water Association - Board Meeting Minutes

**December 3, 2004.**

Place: Keys Café, Lexington and Larpenteur, Roseville, Minnesota.

Attending: Chris Elvrum, President; Laurel Reeves, President Elect; Marty Bonnell, Past President; Eric Hansen, Treasurer; Jon Pollock, Secretary; Sean Hunt and Jennie Leete, WRI.

Past Minutes: Minutes for the Regular Board Meeting held on November 5, 2004, were approved.

Treasurer: Fall Conference net income approx. \$8,000.00. Net income in 2004 is approximately \$17,000.00. Total cash balance is approximately \$37,000.00.

Membership: About 330 renewals thus far. Last year there were 618 members. On pace to meet last year's number.

Web Page: Page for fall conference including photos and PDFs of some of the talks. Scanning project has been completed. CD will be available for members for \$15.00 and for non-members at \$40.00. Will be on website in membership area. CD will be searchable across all articles.

Foundation: Will be meeting week of December 6th. \$20,436.00 sent to Science Museum of Minnesota. No well drilling date set.

Education: Science Museum LCMR project pending legislative approval. If funded it will add ground water displays to the well area in the Big Back Yard

Newsletter: Redesign team estimates that redesigning the newsletter will cost approximately \$1800.00. Motion that Board approve redesign of the newsletter and allocate funding to develop a prototype and style sheet for up to \$1,800.00.

Old Business: Fall Conference – Responses on evaluation sheets were positive. WRI will email responses. Officer Elections — Dale Setterholm is Presidential candidate. Craig Kurtz is Treasurer candidate.

New Business: Job Posting on Website - Posting discussed. WRI would take information from employers and post on web site.

Spring Conference — Discussed possibility of having MGWA Spring

Conference in Minneapolis with the North Central GSA Meeting in May. The possibility of holding the two together will be explored.

**January 14, 2005**

Place: Keys Café Lexington and Larpenteur in Roseville, Minnesota

Attending: Laurel Reeves, President; Dale Setterholm, President Elect; Chris Elvrum, Past President; Craig Kurtz, Treasurer; Eric Hansen, Past Treasurer; Jon Pollock, Secretary; Norm Mofjeld, Newsletter Editor.

Past Minutes: Minutes for the Regular Board Meeting held on December 3, 2004 were approved.

Treasurer: 2004 income approximately \$12,515.00. Total cash balance is approximately \$32,760.00. Motion: Craig Kurtz to be added and Eric Hansen to be removed as signatory to the Affinity Plus and Wells Fargo Checking Account. Motion passed unanimously.

Membership: No report.

Web Page: No Report. Past Newsletters have been scanned and are available on CD. Newsletter Team will work with WRI to put a piece in newsletter about the availability of the CD.

Foundation: No report.

Education: Science Museum drilling to begin in January. MGS may assist in logging well.

Newsletter: Will design prototypes. March issue will probably be in present format. June issue may be in new format. New format should be easier to read online. Newsletter Team will meet to review editor's section of MGWA Operations Manual.

Old Business: Spring Conference – President signed agreement with GSA for joint conference in May of 2005.

New Business: Water Law Conference — Group is requesting MGWA cosponsor water law conference in mid May. Past President will contact group and offer to send out email to MGWA membership for a reduced rate to conference. Fall Conference — Tracers brought up as a possible topic. Independent Contractor Agreement — No rate increase in 2005 proposed contract. Motion: Approve WRI Independent Contractor agreement for 2005 as presented. Motion passed unanimously.

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## New Members for 2004

Allison Fraser, Westwood Professional Services

Amal Djerrari, Hydrogeological & Modeling Services

Amanda Goebel, Washington Co.

Angela Piner, HDR Engineering

Ann Reppe, Target Corp

Annalee Garletz, Association of MN Counties

Barb Jackson, MPCA

Beth Nixon, Emmons and Olivier

Brad Ruchti, Glacial Ridge Drilling

Carol A. Blommel, Apple Valley

Catherine Ferguson, SECOR International

Chris Engelmann, DPRA Inc.

Crague C. Biglow, MPCA

Dagmar Romano, MPCA

Dale Homuth, DNR Waters

Dan Pelczar, HNTB Corporation

Dan Schiefert, Yaggy Colby

Daniel DeJoode, Peterson Environmental Consulting

Daniel Duehlmeier, Northern Dewatering

Daniel S. Flo, Dept of Commerce

Daniel V. Plovnick, Tetra Tech EM

David A. Larson, Larson Environmental Consulting

David Duffey

David J Brown, EarthTech

David Katzner, Dakota Co

Dick Argue, Stonehedge Development

Don Hansen, USGS

Donald A Wallen

Doug Norris, DNR Eco. Services

Douglas D Hansen, MPCA

Edward Quinn, DNR Parks

Elizabeth Keefner, Emmons and Olivier

Gary Elsner, MN Dept of Ag.

Gonzalo Sanchez, Sanchez Inc.

Herb Garcia, Minnesota

GeoServices Inc.

—Continued on next page.

## New Members, cont.

Howard M. Trussell  
Jean Hanson, MPCA  
Jeff Neisse, Delta Environmental  
Jennie Ross, SRF Consulting  
Jennifer A. Haas, MPCA  
Jerry Mullin, Landmark Env.  
Jim Ford, Pinnacle Engineering  
Joe Tenley, McGhie & Betts  
John Anderson, St. Mary's Univ.  
John Barry, Emmons and Olivier  
John Evans, Hennepin Co  
John Harford, Rochester-Olmsted  
Planning Department  
John Heine, NRRI-UMD  
Karl Zenk, Pinnacle Engineering  
Kelly Wheaton, MDH  
Kevin Faus, MPCA  
Kevin Mustonen, Terracon  
Kirsten Pauly, Sunde Engineering  
Lanya Ross, Shakopee  
Mdewakaton Sioux Community  
Lawrence Zdon, MPCA  
Lifeng Guo, MPCA  
Lori Haak, City of Chanhassen

Luke Lunde, McGhie & Betts  
Marcel Jouseau, Met Council  
Mark Cleveland, MN DNR Parks  
Mark Engel, Yaggy Colby Assoc.  
Mark Toso, MPCA  
Matt Baumgartner, Terracon  
Matthew Marckel  
Megan Larson, Bay West Inc.  
Melanie Niday, Earth Tech Inc.  
Michael Thein, Thein Well Co.  
Mitchell Gilbert, Forester  
Molly Shodeen, DNR Waters  
Nick Bonow, McCain and Assoc.  
Nile Fellows, MPCA  
Paul Hoff, MPCA  
Paul Meneghini, Enbridge Energy  
Peter MacDonagh, Kestrel Design  
Group  
Philippe Le Grand  
Ray Stoelting, BP-Atlantic  
Ritchfield  
Richard Erpelding, DNR Wildlife  
Robert C. Melchior, Bemidji State  
University emeritus  
Robert Merrill

Robert Waidler, Environmental  
Troubleshooters  
Ron Holm, The RETEC Group  
Rowdy Bindert, TestAmerica  
Sara Konrad, MPCA  
Scott D. Sell, Wenck Associates  
Scott Zurn, Bay West Inc.  
Shannon Lotthammer, Prior Lake -  
Spring Lake WD  
Ted Hubbes, Braun Intertec  
Terry Schultz, Black Dog WMO  
Terry Schwalbe, Lower MN Water-  
shed District  
Thomas P. Collins, RFC Eng.  
Tim Crocker, DNR Waters  
Tim Lustig, GME Consultants  
Timothy Grape, STS Consultants  
Tina Pint, Barr Engineering Co  
Tom Polasik, DNR Central Region  
Headquarters  
Tracy L. Mogg, Grass Lake Water-  
shed Management Organization  
Trika Nelson, ARCADIS  
Zbigniew Malolepszy, Minnesota  
Geological Survey

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## Minnesota Ground Water Association Newsletter Advertising Policy

### 2005 Annual Rate for Display ads:

	Horz x Vert (in.)	Newsletter	Directory
Business Card	3.5 x 2.3	\$66	\$50
Quarter Page	3.5 x 4.8	\$121	\$99
Half Page	7.5 x 4.8	\$225	\$190
Full Page	7.5 x 9.75	\$425	\$360

**Classified ads:** Classified ads in the newsletter are charged at the rate of \$3 per 45 characters (including spaces and punctuation) per newsletter issue.

**E-mail notices:** A one-time e-mailing to the membership costs \$10 for an individual (e.g., seeking a job), and \$50 for an organization (e.g., announcing a new product, job opening etc.). A 200 word limit is imposed. The advantage of e-mail is the speed of dissemination.

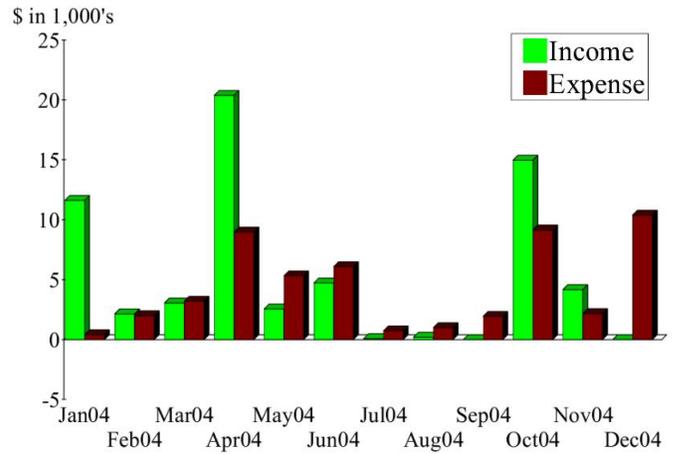
The Advertising Manager has final determination on the acceptance of materials submitted. There are no commissions on ads. Copy must be received by the publication deadlines given on the inside front page. Advertisers should submit their material as a digital file in TIFF, JPEG or PCX format at 300 to 600 dpi. A set-up charge will be applied to non-digital ad material.

Please make checks payable to "Minnesota Ground Water Association" or "MGWA." Direct your orders and questions concerning advertising rates and policy to the Advertising Manager: Jim Aiken, Advertising Manager, c/o MGWA, 4779 126th Street, White Bear Lake MN 55110-5910; Phone (952)470-0983; [jaiken@mccainassociates.com](mailto:jaiken@mccainassociates.com)

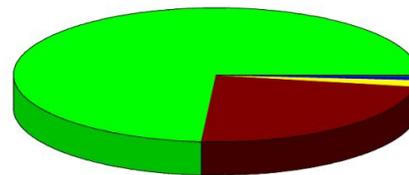
# 2004 Financial Report

	Jan - Dec 04
<b>Income</b>	
Total 3100 Contributions	pass through
Total 3200 Dues	15,094.00
Total 3300 Ads	1,022.25
<b>3400 Interest</b>	41.75
<b>3500 Prog. Fees</b>	
3510 Spring Conference	23,365.00
3520 Fall Conference Fees	19,362.85
3530 Workshop/Field Trip Fees	4,675.00
Total 3600 Products	576.00
<b>Total Income</b>	<b>64,136.85</b>
<b>Total COGS</b>	<b>0.00</b>
<b>Gross Profit</b>	<b>64,136.85</b>
<b>Expense</b>	
<b>4000 Administration</b>	
Total 4100 Financial Admin.	2,967.67
Total 4300 Correspondence	847.49
Total 4400 Board of Directors	702.30
Total 4500 Dues Billing	3,040.09
Total 4600 Database Maint	2,700.00
<b>Total 4000 Administration</b>	<b>10,258.55</b>
<b>5000 Programs</b>	
Total 5100 Spring Conference	13,177.49
Total 5200 Fall Conference	11,874.75
Total 5300 Fen Workshop/Field Trip	4,674.29
<b>Total 5000 Programs</b>	<b>29,726.53</b>
<b>6000 Member Services</b>	
Total 6100 Newsletter	5,840.98
Total 6200 Directory	891.28
Total 6300 Member Corresp.	2,134.30
<b>Total 6000 Mem Services</b>	<b>8,866.56</b>
<b>7000 Public Service</b>	
Total 7099 Fees and Taxes	50.00
Total 7200 MGWA Foundation	2,553.39
Total 7300 Public Education	178.25
<b>Total 7000 Public Service</b>	<b>2,781.64</b>
<b>Total Expense</b>	<b>51,633.28</b>
<b>Net Income</b>	<b>12,503.57</b>

Income and Expense by Month  
January through December 2004

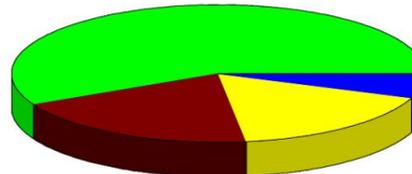


Income



3500 Prog. Fees	%73.91
3200 Dues	23.53
3300 Ads	1.59
3600 Products	0.90
3400 Interest	0.07
<b>Total</b>	<b>\$64,136.85</b>

Expenses



5000 Programs	%57.57
4000 Admin	19.87
6000 Mem Services	17.17
7000 Public Service	5.39
<b>Total</b>	<b>\$51,633.28</b>

