

Minnesota Ground Water Association

www.mgwa.org

Volume 20, Number 1: March, 2001

President's Column

—Jim Stark, MGWA President
(stark@usgs.gov)

Welcome to the first Minnesota Ground Water Association (MGWA) newsletter of the new millennium. As I prepared this column, I reflected some on the history of this Association. It is difficult to admit that I attended the organizational meeting of the Association, which now approaches its twentieth anniversary. We organized during the heyday of the "Superfund Era", when ground-water hydrology was an emerging scientific field. There have been many changes in the field of ground water since that time, from both technical and political points of view. In spite of these changes, ground water remains an important conservation and developmental issue within our State, the nation, and in the world. As members of this Association we share a common concern about the protection of ground water, and promote that concern through education about ground water and ground-water issues. I am honored to be associated with the members of this Association. We perform a service within our State. The good that we have done as an organization is due to the hard work of many dedicated volunteers.

The MGWA remains a strong and viable organization. Membership continues to grow to greater than 600 individuals. We also continue to strengthen our efforts at internal education and outreach. We now have an associated non-profit foundation where your tax-deductible contributions go directly toward educational outreach activities and student scholarships. We sponsor two conferences each year, a yearly field trip (with the AIPG), and our quarterly newsletters. We are planning to make this newsletter available in electronic form to

enhance our ability to display color graphics, and to reduce some of the expenses associated with the duplication and mailing of hard copies. We continue to support our informational web site (www.mgwa.org), and are beginning to organize a speaker's bureau to respond to outreach requests. There are many other areas where we should be involved. There are plenty of opportunities for you to be involved with the MGWA. Please let me know if you are willing to run for an office, participate on a sub-committee (membership, advertising, foundation, education, newsletter, or web page), help with a field trip, or write a technical article or editorial contribution to the newsletter.

We have changes in the membership on our Board. When you see them, please thank Jim Lundy (past president) and Lee Trotta (past treasurer) for their hard work during past year. Both Jim and Lee did a great job and luckily they are willing to continue to help with the association's activities. You have also elected new officers. Rob Caho (Bergerson-Caswell, Inc.) is our president elect, and Eric Hanson (Pinnacle Engineering) is our treasurer. I hope you will join me in congratulating them and thanking them for their willingness to serve. We welcome them to the Board.

Our spring conference is now being planned (See more about it in this issue). The theme is "Emerging Issues in Ground Water Technology and Science". The meeting will be held on April 10th, at the Earle Brown Center on the St. Paul campus of the University of Minnesota. You will receive registration material soon, but please mark the date on your calendar. Our fall (2000) conference focused on how science can be used to guide ground-water regulation and management in the state. About 130

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The Use of Multispectral Images for Locating Wetland and High Water Table Conditions, City of Rochester, Minnesota

Dan Barrett and Tim Modjeski, Northern Environmental Technologies, Inc. and Terry Lee, Olmsted County Environmental Resource Services

Editor's Note: The area around Rochester is rapidly urbanizing. Readers may want to revisit two articles from previous MGWA newsletters to refresh themselves on the geology and unique development problems this area faces: Hydrostratigraphy of Paleozoic Bedrock, Southeast Minnesota (Vol 17(2), June 1998) and Life on "The Edge" – Rochester Plans to Protect Recharge Areas (Vol 16(3), September 1997)

Introduction

The purpose of the project was to map areas where groundwater flowing over the terminal edge of the Decorah confining unit either surfaces or is close to the surface. In such areas, biological processes may be

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June 2001 Newsletter Deadline

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President's Column, cont.

of our members heard the latest about topics from pharmaceutical chemicals to viruses, and from arsenic to nitrate. We compiled a list of ground-water issues that we believe need to be addressed by the State legislature. These issues included:

emerging ground-water contaminants,
nitrate contamination,
sustainable ground-water supply,
adequate funding for governmental programs,
environmental education, and
agency coordination.

An expanded summary of the consensus opinion is included in this volume, and is posted on our web site. We have prepared a fact-sheet to be distributed to our State legislators. Please consider discussing the importance of these issues with them.

That's it for now I guess. Our organization has much of which to be proud. However, there is always more to be done. Please feel free to contact me. We could use your help.

important in the uptake and storage of nitrogen as biomass or removal via denitrification. The project covered all of the undeveloped Rochester Urban Service Area where the Cummingsville (member Galena Group), Decorah, Platteville, and Glenwood formations subcrop (Figure 1). Growth in these areas presents unique challenges for planners and developers, particularly in groundwater recharge areas that occur at the terminal edge of the Decorah shale. US Geological Survey modeling suggests that about half of the City of Rochester's groundwater recharge occurs in this setting.

The level of information detail for geology and soils available at the start of the project was generally inadequate for use in predicting water conditions or locating hydrogeologic

features. Areal multi-spectral photography showed considerable value in mapping wetlands and high water table conditions. Approximately 10,000 acres were inventoried using an aerial multi-spectral data collection and computerized image analysis. Results of the analysis were transferred to Geographic Information System (GIS) coverages and used false-color mapping to illustrate relative levels of "wetness".

Advantages of collecting information through this methodology include:

1. Digital images and photographs are an objective record at a given point in time;
2. Aerial images capture existing site conditions in a single image;
3. Digital files are easily georeferenced, stored, and transferred;
4. Aerial digital imagery is very cost-effective on a per-acre basis; and
5. Evaluation criteria can be consistently applied across all sites.

Data Collection

The collection and processing of airborne daytime multispectral images was provided by A.W. Research Laboratories, located in Brainerd, Minnesota. The Rochester Study Area was flown using the Lake Buccaneer airplane equipped with an array of onboard cameras. The survey was conducted to cover all of the undeveloped area within the 50-year urban service area in which the first encountered bedrock is the Cummingsville, Decorah, Platteville, or Glenwood Formations. Figure 2 shows the distribution of collected overflight data.

The following is a breakdown of the spectral bands collected.

Visible Light
Color Infrared – (no blue)
Carotene hyperspectral – (blue)
Chlorophyll II hyperspectral – (red)
Near-IR hyperspectral – (water absorbing)

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Multispectral Images, cont.

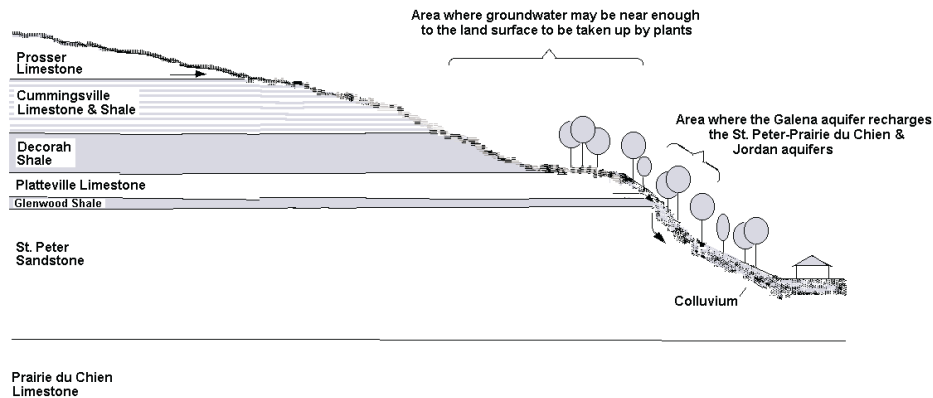


Figure 1. Geologic setting in the Rochester, MN area.

Chlorophyll *a*, Near-IR hyperspectral, and the Infrared bands were the primary bands collected for showing water and wet areas. The Chlorophyll *a* band was collected to reveal the history of water infiltration by showing patterns of healthy vegetation as a result of the presence of water over time. The infrared images were collected to show areas of open water or

wet areas at the time of the flight. Near-IR hyperspectral images were collected to show wet soil conditions.

The area was flown on two separate dates. The first flight was conducted on April 13, 1999, and was aborted due to changing weather conditions. The second flight was conducted on April 24, 1999. Most of the images

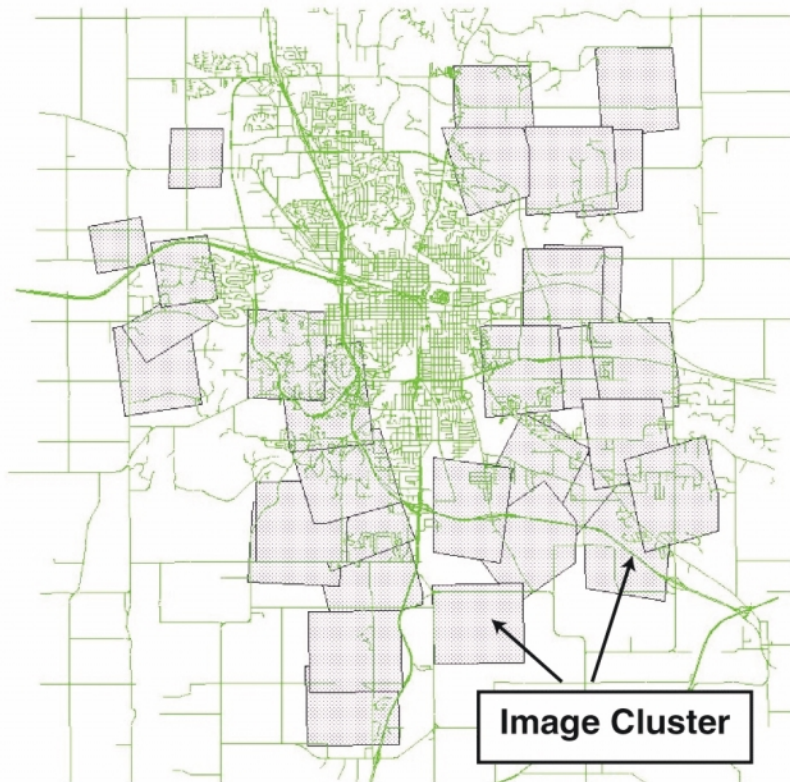


Figure 2. Distribution of overflight data, Rochester, MN.

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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.

Multispectral Images, cont.

used were recorded during the April 24th mission. Ideal conditions include:

- High, thin clouds or clear
- Calm wind - <8 mph
- Air temp of 50⁰ to 70⁰ F.
- No snow event within one week
- No rain event within 3 to 4 days
- North and south-facing slopes are not frozen
- Soil has drained from the spring thaw

The data was collected by initially flying east-west patterns at high altitude starting in the northeast corner of the study area. During the flight, hyperspectral cameras were running continuously while visible and infrared 35mm slides were shot of entire sections. Hyperspectral images were fed to small monitors in the plane for monitoring and interpretation during the flight. Following the high-altitude flight, low altitude passes were made concentrating on suspected seep areas as defined by the high altitude data.

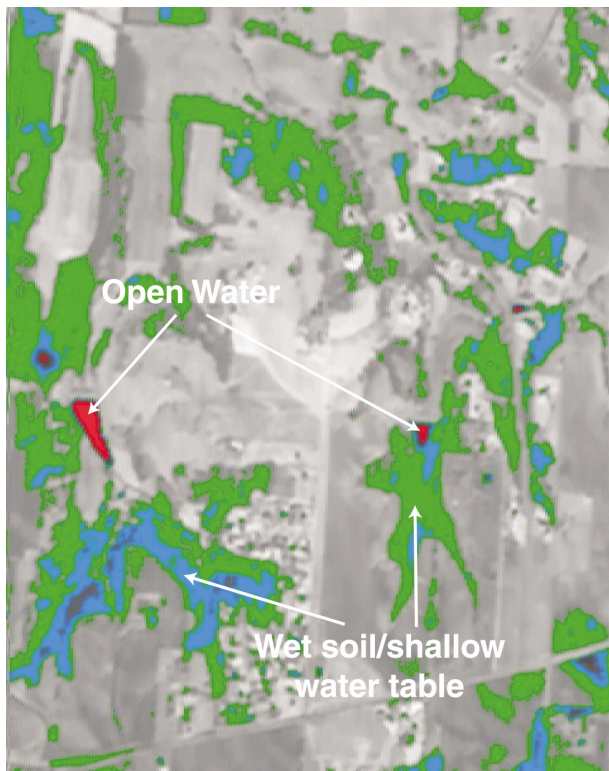


Figure 3. Example of overflight data, Rochester, MN.

Analysis of Collected Images

In order to overlay the raster data onto other maps, the collected images had to be georeferenced to a known coordinate system. Known coordinates from existing Digital Ortho Quad (DOQ) photos were matched to the collected images.

Georeferencing software was used to transform the collected images to the US 1927 zone 15 datum.

Remotely sensed data was processed into wetness maps by subjecting each raw data set to a supervised classification of spectral clusters related to soil moisture conditions. The Chlorophyll *a*, infrared, and near-infrared hyperspectral bands were the best at showing moisture conditions and were used for the inventory analysis. The Chlorophyll *a* band revealed the history of water infiltration by showing patterns of healthy vegetation as a result of the presence of shallow ground water over time. The infrared and near infrared distinctly shows areas of open water or wet soil conditions at the time of the flight. An example of overflight data is presented as Figure 3.

A color-coded scheme was used as an overlay on the infrared images to show different degrees of wetness that correspond to seep areas (wet soil conditions), areas with shallow water table conditions, or open water. Red areas correspond to open water areas, blue areas



Figure 4. Wetness classification map, Rochester, MN.

represent the next-most wet area, and finally the green areas were the next degree of wetness. Figure 4 shows an example of the wetness maps produced for this project.

The areas showing the lowest degree of wetness were primarily defined by the Chlorophyll *a* band which revealed the history of water infiltration by showing patterns of healthy vegetation as a result of the presence of shallow ground water over an extended period of time. Because of the infestation of buckthorn and honeysuckle plants, which showed significant green vegetation early in the growing year, the conclusions may be biased by these plants. As such, it appears that portions of the lowest degree of wetness defined by the green color represent portions of the study area dominated by buckthorn and honeysuckle.

In addition to the bias generated by the buckthorn and honeysuckle plants, the flight took place during an unusually wet spring. The average precipitation for the month of April recorded over the past 30 years is 2.73 inches. Prior to the flight, there were several single rainfall events over one inch (Figure 5). As a result of the heavy rain prior to the flight, some wet ground conditions may be a result of local short-term conditions, such as water collecting in low areas,

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Multispectral Images, cont.

not related to seeps or shallow ground water conditions.

Conclusion

Remotely sensed data has considerable value in mapping wetlands and high water table conditions. Based on follow-up field investigations, the maps generated by the multi-spectral photography are reasonably correlated with hydric features such as ponds, wetlands, seeps, and seasonal high water tables. The study showed a distinct correlation between the presence of hydric soils and the continuity and lateral extent of the Cummingsville Formation. At locations with a small lateral extent of Cummingsville Formation above the Decorah Shale, wetland features and shallow water table conditions are absent or limited in size. Additionally, it appears that the scale and accuracy of the inventory is sufficient to guide land use plan amendment and rezoning decisions.

Funding for this project was provided by the Legislative

The Capillary Fringe

Beyond what science is telling us...

Editor's Note-The following article was written by Roman Kanivetsky, Hydrogeologist with the Minnesota Geological Survey in response to the MGWA Fall Conference Outcomes Summary that appeared in the December 2000 newsletter. Opinions expressed are the author's and do not necessarily reflect those of his employer or the MGWA.

My general impression is in reference to the title of the conference "What Science is Telling Us..."? And I mean SCIENCE. I do think that now the regulators do not use science at all. As a result, rules and regulations are replacing science as is evident even from this summary.

We do not currently have a scientific knowledge of ground water resources (both quantity and quality). Therefore, the action should be to establish an office of statewide assessments and trends, including surface water issues, with strong

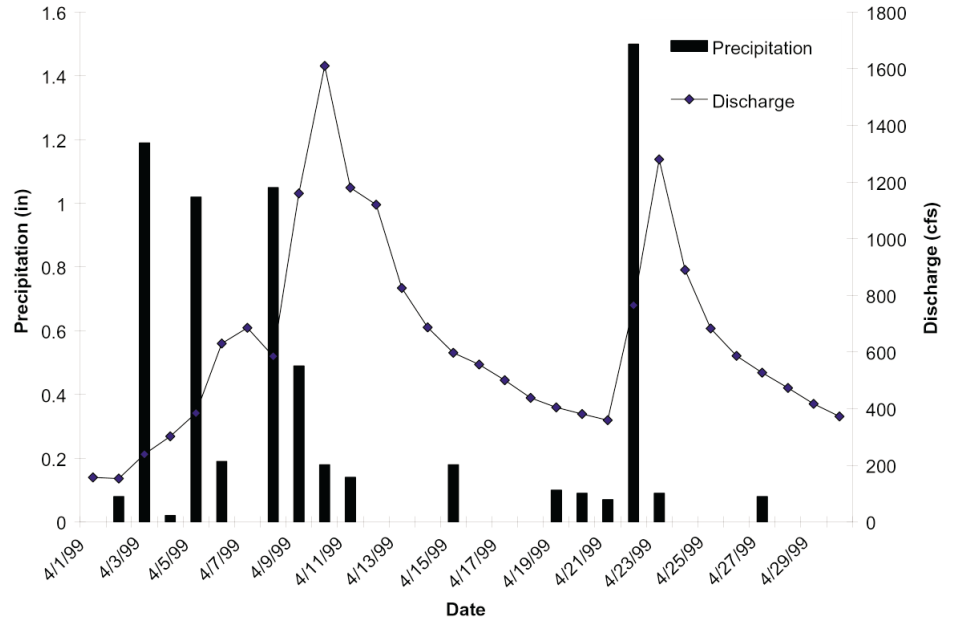


Figure 5. Precipitation at the Rochester, MN airport and river discharge at 37th Street NW, Rochester, MN.

funding. Without such an office with a strong mandate and funding, the science will be playing second fiddle as we have seen for the last quarter of a century, until some calamity or crisis happens. It could be similar to this past year's election scenario.

This new office could be at any agency. The purpose of this office would be to synthesize the huge amount of information that has been collected, analyzed and reported in the state over many years. The information and maps would be produced for the entire state by region and water basins.

This office could produce the following real science information:

1. Cartographic presentation (mapping) of ground water recharge rates (statewide, basin wide, regional).
2. Development of a science based monitoring network (now the observation network is developed without science), including ground water/surface water interaction, recharge zoning, sensitivity.
3. Develop status and trends of nitrates and other contaminants and indicators, including emerging

contaminants by state, regions and basins.

4. Evaluate trends in agricultural impacts.
5. Valuation of water resources (pricing of water).
6. Electronic delivery of information by agencies.

If we have this information, then the science will lead regulation. As it stands right now the regulation is leading, not the science. It was abundantly clear from a good presentation from Rep. Dennis Ozment.

If you want to use your model of needs, then at least each county and regional assessment should include a recharge map based on real science.

I do not know if you agree, but this is my honest opinion based on the record of a quarter of a century. We talked about the same issues in the late 1970's, and they are the same. There is a definite need for a bold and radical change to inject science into development of new laws and regulations.

Results of 2001 MGWA Elections

MGWA is pleased to announce results of the 2001 officer elections. Rob Caho is the new President-elect and Eric Hansen is the new Treasurer. Read about Rob and Eric below and see contact information for all the officers in the sidebar on page 3.



Robert Caho, President-Elect

I'm an Operations Manager for Bergerson-Caswell, Inc. with 20 years of experience in the drilling field as a driller, field supervisor and drilling project manager. My education includes Fundamentals of Drilling and Pressure Grouting & Fundamentals of Drilled Piers and Caissons - State of Illinois, as well as Business/Management Training - University of Wisconsin/Madison and numerous Safety Training courses.

I have previously served as President of the Minnesota Chapter of the National Drilling Association and a Secretary/Treasurer for the National Drilling Association. My expertise lies in the area of field project set-up and on-going management, with extensive experience in the installation of monitoring wells throughout the Midwest and Southwest. In addition I have experience and knowledge in air rotary, mud rotary and hollow stem auger drilling.

Personally, my wife Cathy and I enjoy our involvement with the Wisconsin Racing Association where I drive a 360 Championship Sprint Car.

I am willing to volunteer my time as MGWA President to ensure that the MGWA continues to be a resource for open communication and educational opportunity for its members.



Eric Hansen, Treasurer

I am currently Vice President of Environmental Engineering at Pinnacle Engineering, where I've worked for the past five years.

I am a geological engineer and hydrogeologist with bachelor's degrees in Geo-Engineering and Geology from the University of Minnesota. I've worked in the Minneapolis/St. Paul consulting community for over 13 years. Past positions include L. Lehman & Associates and Twin City Engineering.

My consulting experience has provided me a view of practical applications for ground water management and protection in Minnesota.

As MGWA Treasurer I hope to provide the organization with the support it needs to continue. I have seen the tremendous growth in the association over the past years and would like to be a part of sustaining that growth. As a principal at Pinnacle Engineering, I have managed company budgets and look forward to bringing this experience to the MGWA board.

State Agencies use CWI Data in ArcView to Visualize Subsurface

Editor's Note: The use of Geographic Information Systems (GIS) in everyday work among ground water professionals has expanded greatly in the last few years. In particular, a popular ESRI product, ArcView, has seen expanded application among state and local users. Additions to the program called extensions add greatly to its functionality and ease of use. Here are two examples of extensions created to solve a common problem, visualizing borehole lithology and subsurface geology. Both are available from state web sites.

The newsletter team intends to publish more GIS-related information in future issues. If you have a GIS application for ground water or a nifty tool, available to the public, such as those described in this issue, please give the newsletter team a call.

New ArcView Extension from DNR Waters Helps Make Geologic Cross Sections

Jim Berg, DNR Waters and Randy McGregor, formerly DNR Waters, currently Natural Resource Group, Inc.

For several years DNR Waters and the Minnesota Geological Survey have been adding a new dimension to the regional hydrogeological assessment series (RHA's). We have been adding maps of Quaternary buried sand and gravel aquifers to the Quaternary geology and hydrogeology plates that are included in these reports. We hope that these maps will help ground water appropriators, interested government personnel, and consultants understand the complex distribution of these resources and something about how they were formed. Regional geologic history, surficial geology, and many thousands of well logs were all combined to produce these interpretations. An extensive cross-correlated network of geologic

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cross sections is at the heart of each of these investigations.

The typical regional assessment cross section is 20 to 70 miles long and is made with 20 to 50 well logs. The Otter Tail area RHA alone required 18 separate cross sections to sufficiently define the Quaternary sedimentary sequence. We clearly needed a cross section-producing machine to increase our efficiency and to help produce accurate digital images that could be easily modified for publication and public presentations

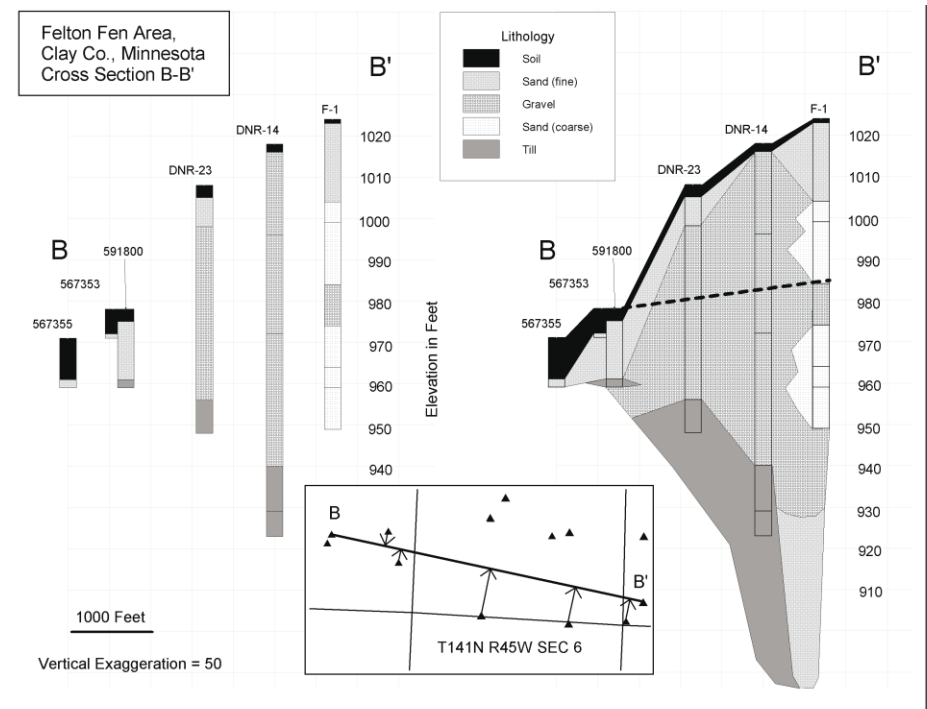


Figure 1: Example output and geologic interpretation of DNR ArcView extension. Inset shows how data locations are projected onto a line connecting start and end points.

From an Arcview View document, the user selects several wells in a relatively straight line, creates a separate shapefile from these points, then selects the start and end points. The extension uses the start and end points to define a straight, imaginary line between the two points. All other selected wells are mathematically projected to this line, and their distance in feet from the first point is calculated. The distance from the first well is the “x” value. The “y” value is the elevation in feet at the top of each lithology layer. The extension constructs a stick diagram, one lithology segment at a time, for each borehole log. The result is a polygon shapefile showing each well as a collection of unique lithologic segments. A variety of line and point background grids are available for labeling and display.

The borehole diagram produced by the extension is shown in the left portion of Figure 1.

The interpreted section shown on the right portion of the figure is made by creating a polygon file (or files) of the interpreted subsurface geology based on the borehole diagrams and combining them in a view.

Minnesota Department of Health County Well Index Improvements for GIS Applications

The Minnesota Department of Health (MDH) and Minnesota Geologic Survey have been working together to develop a new version of County Well Index (CWI) that is easier to use and can be adapted to a geographic information system (GIS) format. To visualize wells in the CWI, MDH maintains two files using ArcView shapefile format to store the well locations. One file contains locations that have been verified and the other uses locational information provided on the well record. As of January 2001, the CWI contains

approximately 294,000 records and the shape file with verified well locations contains approximately 130,000 points. Both the CWI and these shape files are updated four times a week.

MDH staff have developed an ArcView application that presents CWI well log data as borehole diagrams that can be interpreted for cross sections. Scaled cross sections that would have taken half a day to draw by hand are now produced within seconds using this application. A cross section extension in ArcView allows the user to select or “click” on located wells in CWI to produce a cross section. Only wells that have the stratigraphic log and elevation information can be used by this application. The extension tool produces several themes in an ArcView Project that provide the unique number, geological information, aquifer, well construction information, static water level, and elevations of stratigraphic contacts. The user chooses the vertical and horizontal exaggeration for the projection of the cross section. Using ArcView View and Layout tools, a

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CWI Data in ArcView, cont.

cross section view can be brought into a layout format to add the scale, north arrow, a legend, a map showing the location of the cross section, and any additional text, such as vertical or horizontal exaggeration. An example of a borehole diagram produced with this tool is shown in Figure 2.

Bill Olsen, Dakota County Environmental Management Department, provided MDH with the original script to construct the cross sections. Al Epp, MDH Source Water Protection Unit, adapted the script for an ArcView extension. Although this cross section tool is designed for the MDH computer system, MDH plans to have the cross section tool and the new County Well Index available on the MDH web site. For questions concerning the cross section tool, please contact Al Epp at (651)215-1325.

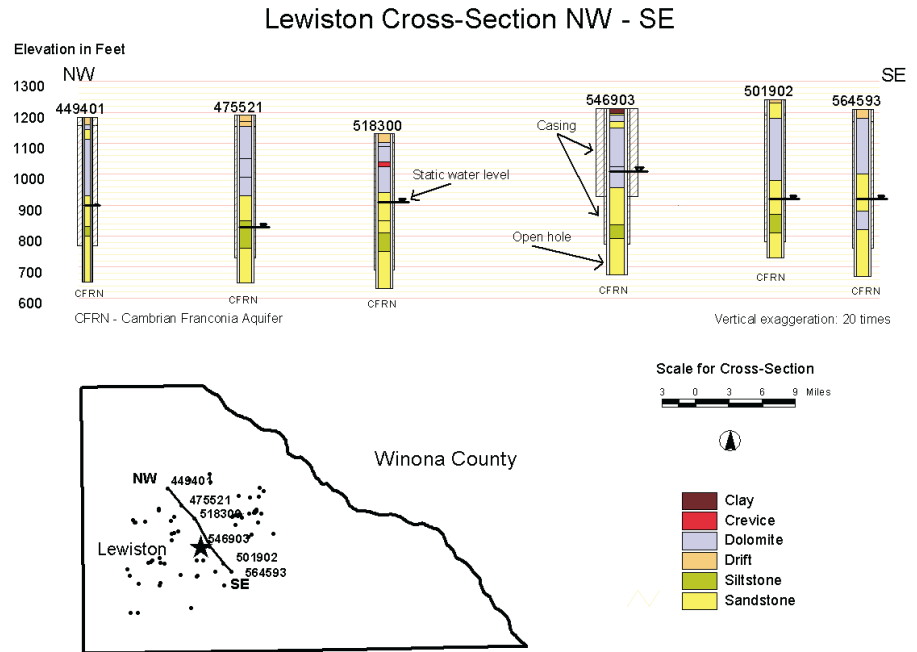


Figure 2: Example output of MDH ArcView extension. County inset map shows how the extension connects selected data points.

Treasurer's Report

by Lee Trotta, MGWA Treasurer

Much was accomplished by the Minnesota Ground Water Association during 2000. As departing Treasurer, I will summarize the year's money matters. Rising costs of providing member services – keeping track of the membership, doing accounting and IRS filings, producing the directory and newsletters had not been fully funded by membership dues for several years. Profits from conferences have been used to take up the slack. Of course, there is some risk in conference finances because we never know until the day of the conference if the fixed costs will be covered by registrations!

Part of the problem was addressed this year by deciding to raise 2001 dues to \$25. However, since that decision was made, the price of printing and mailing a newsletter has continued to rise rapidly and will likely continue to do so. Were it not for successful conferences, the Association would have ended the year in the red. In the past, the Association's intention has been to use conference proceeds

for public service ground water education and to build reserves in case conference revenues do not cover conference expenses. Membership dues are intended to cover all expenses of running the organization. Elsewhere in this newsletter alternatives to control newsletter and printing costs are discussed (page 14).

Our popular Spring Conference on "Minnesota Water Law" filled the house. We shared profits with AIPG on a successful Fall Field Trip in the Lower Minnesota River Valley and shared a few beers in New Ulm. The Fall Conference on "Minnesota's Emerging Ground Water Quality Issues" was one of the most successful ever in providing quality ground-water education to a wide audience. We ended the year with a net profit of \$1,279.53.

The new MGWA Foundation was created in 2000. All scholarship contributions from the membership were passed through to the Foundation and thus are now deductible as charitable contributions.

The new Treasurer, Eric Hansen, has a good background in finance. From a financial standpoint, our

Profit and Loss Statement for Year 2000

Income

Recycling Contributions	\$192.00
Dues	\$11,015.00
Newsletter Ads	\$883.75
Interest	\$1,199.93
Program Income	\$21,140.00
Product Income	\$574.90
Total Income	\$35,005.58

Expenses

Administration & Member Service	\$6,650.77
Program Expenses	\$14,978.53
Publication Expenses	\$8,753.55
Public Service	\$3,299.25
Product Expenses	\$43.95
Total Expenses	\$33,726.05

Net Income **\$1,279.53**

Practical Ideas to Increase the Effectiveness of Ground Water Management and Recommendations for Future Directions in Ground Water Law

The Minnesota Ground Water Association (MGWA) is a professional organization concerned about protection of ground water resources through education and the availability of scientific information. MGWA members share an interest in conservation, protection and safe utilization of ground water, and represent consulting, industry, government, and academia.

At the urging of the Minnesota House of Representatives subcommittee on ground water, MGWA's November 2000 conference asked the question "***What is science telling us about the need for new ground water law in Minnesota?***" Approximately 130 attendees, many of the best of Minnesota's ground water professionals, listened to presentations on topics from pharmaceuticals to viruses, from nitrates to arsenic, and participated in discussions to generate possible answers to the question posed above.

This fact sheet summarizes their answers. We hope it will be useful to decision and policy makers as they wrestle with how best to manage Minnesota's ground water resources. A complete listing of attendees' responses is located on the web at www.mgwa.org.

Attendees identified six major concerns:

- ◆ Emerging ground water contaminants
- ◆ Nitrates in ground water
- ◆ Sustainable ground water supply
- ◆ Stable funding for ground water programs
- ◆ Education
- ◆ Agency coordination

Emerging Ground Water Contaminants of Concern

Scientists are studying contaminants not previously considered a significant environmental concern including pharmaceuticals (e.g., lipid regulators, heart

medicine, acetaminophen, and antibiotics), pesticide degradation products (from the breakdown of chemicals used in the environment), and industrial compounds (detergent breakdown products, fire retardants, plasticizers etc.). Some of these compounds are known or suspected endocrine disruptors (alteration of normal endocrine system function). However, there is little toxicological information for many of these contaminants (or mixtures). The occurrence of these compounds in ground water is not well known. Laboratory analytical methods are being developed, but may not be readily available, and are expensive.

Actions Needed: Promote sustainable ground water protection, including:

- ⇒ Development of laboratory analytical methods for emerging contaminants;
- ⇒ Long term trend monitoring for emerging contaminants;
- ⇒ Toxicological assessment of emerging compounds and compound mixtures.

Nitrates in Ground Water

Nitrates exceed drinking water standards in some shallow aquifers in Minnesota, presenting a potential health concern. The 1989 Ground Water Protection Act addressed agricultural sources of nitrogen in ground water, but the program was not funded.

Actions Needed:

- ⇒ Identify and fix poorly constructed wells, inadequate individual septic systems, and agricultural sources of nitrate to ground water;
- ⇒ Promote best management practices (BMPs) for nitrate fertilizer;
- ⇒ Evaluate crop yield insurance and other incentive programs;
- ⇒ Require recording nitrate concentrations on property deeds.

Sustainable Ground Water Supply

Ground water resources are limited in some areas of Minnesota, and new development threatens existing resources in other areas.

Actions Needed: Enable existing programs to provide regional assessments and protection of ground water resources, including:

- ⇒ **Ground water recharge** - recharge zone protection, recharge chemistry, and water budgets and sustainable yield for heavily used aquifers;
- ⇒ **Development** - determine value of wetlands, assess long term impacts of urban development on ground water, and discourage water intensive development in areas of limited supply;
- ⇒ **Agriculture** - promote BMPs, evaluate risk/benefit derived from drainage reductions, and evaluate differences in regulations relative to wastewater treatment for large feedlot operators and municipalities;
- ⇒ **Conservation** - statewide assessment/regulation of dewatering operations, and alternative uses of non-potable ground water.

Stable Funding for Ground Water Programs

Attendees were frustrated about poorly funded programs, and emphasized the need to provide adequate funding for existing regulations.

Actions Needed:

- ⇒ Provide/protect long term funding for ground water activities;
- ⇒ Require effectiveness monitoring for BMPs, Conservation Reserve Enhancement Program (CREP), and Reinvest in Minnesota (RIM);
- ⇒ Increase funding to State mapping agencies (Minnesota Geological Survey, MGS, and Minnesota Department of Natural Resources, MDNR) to provide the hydrogeologic framework for developing conceptual ground water models.

Education

Minnesotans do not adequately recognize the true value of ground water, and it seems mysterious to many.

Actions Needed:

- ⇒ Communicate the value of ground water, and educate the public on the importance and cost of ground water research and conservation;
- ⇒ Promote public education in recharge areas, where ground water is highly vulnerable, or where ground water/surface water interaction is likely;
- ⇒ Promote public service messages about how to protect ground water, how to access ground water programs and data, and cross-linking of non-governmental organization and State agency web pages on ground water.

Agency Coordination

Many agencies and programs conduct ground water activities, which could be enhanced by coordination with other agencies.

Actions Needed:

- ⇒ Designate a lead agency for each program;
- ⇒ Designate and fund a ground water data coordinator for each agency;
- ⇒ Coordinate land and soil use data through a geographic information system (GIS).

These responses summarize opinion of MGWA members. We invite your feedback by sending questions and comments to the MGWA at this address. Please feel free to discuss the importance of these issues with your state legislators.

Minnesota Ground Water Association
4779 126th Street North
White Bear Lake MN 55110-5910
(651)426-6122

email: office@mgwa.org
www.mgwa.org

February, 2001

2000 Membership Survey Results

To get a measurement of members' level of satisfaction with MGWA as an organization, MGWA sent members a survey at the end of 2000 on the back of the officers ballot. The survey asked members to rank their level of satisfaction with MGWA on a variety of topics, including the quarterly newsletter, policy and technical conferences and field trips. Your responses are summarized below.

Newsletter

Members responding were generally positive to the newsletter. Many liked the President's column, the technical articles, the calendar and the Capillary Fringe. Members found advertising and the business meeting notes of the least value in the newsletter. One comment was that the layout "jumps articles around" too much; another wanted to see a color version on the web site.

Conferences

Members responding were satisfied with the conferences. 23 of 25 responses in this category rated conferences satisfactory or very satisfactory.

Field Trips

Field trips were well received. Members had a variety of places they would like to see on the next itinerary.

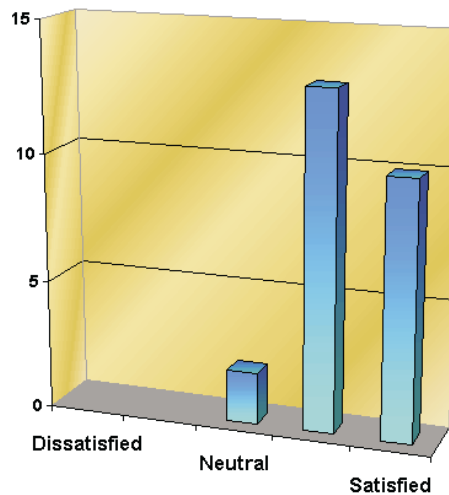
MGWA

Most members responding had been MGWA members for more than 5 years, many for more than 10 years. Most people responding worked in consulting or government.

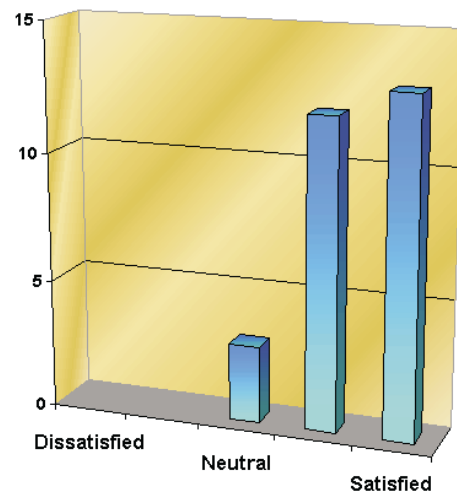
Members overwhelmingly thought that membership in MGWA is worth the dues spent. 96% were satisfied or very satisfied that MGWA is meeting its objectives!

The full text of member responses and summary charts of the survey are available on the web site: www.mgwa.org

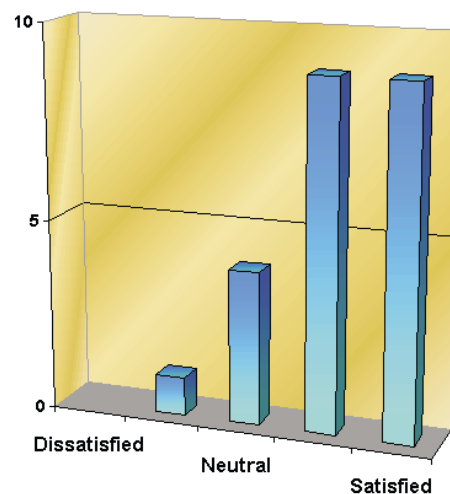
The overall value of MGWA conferences



Topics covered in newsletter articles



Joint MGWA/AIPG/AWG field trips



EPA Publishes Final Arsenic Rule – But is it the last word?

In January, EPA moved to lower the drinking water standard for arsenic. At 10 ug/L the new standard is five times more stringent than the previous standard. In addition to revising the MCL to 10 ug/L, it also establishes the MCLG at zero. The final rule was published in the January 22 edition of the Federal Register and is available on-line from www.epa.gov/safewater/arsenic.html. The new standard will apply to all community and non-transient, non-community public water supply systems. Approximately 4100 such systems will be affected nationwide. In Minnesota, some 60 to 80 community systems and about 45 non-transient, non-community systems will likely be affected.

Public water supply systems will have 5 years after the date of the rule promulgation to come into compliance. Most systems will achieve compliance by installing water treatment, the collective cost of which will be 177 million dollars across the country. In Minnesota, the MDH will also recommend drilling new wells and connecting to other public water supply systems to manage high arsenic levels. Interestingly, deeper is not always better in seeking groundwater with lower arsenic concentrations. Reducing conditions that can mobilize arsenic often are present in deep aquifer systems, whereas shallow water table aquifers are more likely to be oxidizing (see the December 2000 edition of the MGWA newsletter for more information on the distribution and geochemistry of arsenic in Minnesota groundwaters).

The promulgation of the final rule came after several years of rulemaking. The 1996 amendments to the Safe Drinking Water Act required EPA to develop the rule by January, 2001. A proposed rule was opened to public comment on June 22, 2000. The proposed rule set the arsenic standard at 5 ug/L, but solicited comment on using levels of 3

— *continued on next page*

More on the American Institute of Hydrology Meeting in Bloomington, October 14-17, 2001

Dear Colleagues,

The American Institute of Hydrology (AIH) is having its international meeting Oct. 14-17, 2001 in Minneapolis/St. Paul, Minnesota. Both of us are on the planning team for this conference. We would like to invite you to participate. The conference will be held at the Thunderbird Hotel and Conference Center, near the airport along the 494 strip, and close to Mall of America, too! Check out the AIH website at www.aihydro.org for more information. Click on "Annual Fall Meeting" at the home site. (See below for information on AIH also.)

We are in charge of setting up sessions on the Minnesota and Upper Mississippi River Basins. We are planning some sessions on hydrology and flooding, and others on ecology and water quality of the area. If you have suggestions for speakers, or want to volunteer to speak yourself, please contact one of us!

We are planning tours of the St. Anthony Falls Hydraulic Laboratory, the Corps of Engineers' lock and dam, and the historic milling district along the Mississippi River in Minneapolis.

If you need continuing education credits for renewing your professional engineering license, this is a way to obtain Professional Development Hours (PDH's). The cost is expected to be about \$150 for a single day or \$300 for all the days.

Mark the dates on your calendar and join us at the AIH conference Oct. 14-17, 2001! We plan to contact you again at a later date when the conference program is ready, to invite you again to participate, with a complete listing of speakers, topics and tours.

Sincerely,

Peter Cooper
Hydraulic Engineer
NRCS
651-602-7884
Peter.cooper@mn.usda.gov

Sonia Jacobsen
Hydraulic Engineer
NRCS
651-602-7879
sonia.jacobsen@mn.usda.gov

The American Institute of Hydrology (AIH) was formed in 1981 as a non-profit scientific and educational organization. AIH is the only nationwide organization to offer certification to professionals in all fields of hydrology. The Institute adheres to the principles of responsible professional conduct and public service.

The purpose of AIH is to enhance and strengthen the standing of hydrology as a science and a profession by:

Establishing standards and procedures to certify individuals qualified in hydrology and hydrogeology.

Establishing and maintaining ethical standards to protect the public from irresponsible work.

Providing education and training in hydrology.

Providing the public and government advice and guidance concerning activities related to the hydrologic profession.

Arsenic Limits, cont.

ug/L (the minimum feasible level), 10 ug/L, and 20 ug/L. The weight of public comment moved the EPA to revise the standard upwards to 10 ug/L in the final rule.

President Clinton signed the final rule on January 16, during the last week of his term. The announcement indicated the rule would be published in the Federal Register the following week. The following week was, of course, President Bush's first week in office. One of his first official acts in office was to suspend for sixty days the effective date of all new regulations published in the Federal Register but which had not yet taken effect. This was to allow staff in the new administration the opportunity to review the rules. While the final arsenic rule was published in the Federal Register on January 22, a few days after President Bush took office, it is not clear how the rule will be affected by the executive order. Should the new Bush administration decide it would like to change the rule, it would need to initiate the formal re-proposal and re-promulgation process, which can take 12 to 18 months.

Given the substantial natural distribution of arsenic in many parts of Minnesota, this new rule promises to have a significant impact on many public water supply systems in Minnesota. MDH staff are currently tracking the development of the regulations on a federal level, studying the effects the new rule will have on affected PWS systems in Minnesota, and planning ways in which MDH can provide assistance to affected systems.

**Support Your
Association
— Invite a
Student
to Join**

New From DNR

"Minnesota's Water Supply: Natural Conditions and Human Impacts" is available online at:
www.dnr.state.mn.us/waters/
under "Recent Developments".

This Information Paper is a discussion of water supply resource issues for the non-technical reader. The paper includes short discussions of the water budget and human impacts, concerns in water use and protection, and strategies for water supply management.

Caution: this is a large PDF file so, if you're downloading via a modem, it may take awhile. A limited number of printed copies are available. Please contact Laurel Reeves, MN DNR Waters, 651-296-9231 if you would like a printed copy.

EPA Ground Water Rule

The US Environmental Protection Agency (EPA) is proposing to specify the appropriate use of disinfection in ground water and address other components of ground water systems to assure public health protection. A Ground Water Rule (GWR), scheduled to be issued in summer 2001, establishes multiple barriers to protect against bacteria and viruses in drinking water from ground water sources and will establish a targeted strategy to identify ground water systems at high risk for fecal contamination.

The rule consists of five major components:

- periodic sanitary surveys of ground water systems

- hydrogeologic assessments to identify wells sensitive to fecal contamination

- source water monitoring for some systems drawing from sensitive wells

- correction of deficiencies and fecal contamination

Appropriations to Improve Stream Gaging Network

Congress recently passed the Interior Appropriation Bill for Fiscal Year 2001, which includes an increase for the USGS Real-Time Hazards Initiative that supports stream gaging stations and related network activities. This \$3.1 million increase, plus an additional \$5 million that was granted for capital investments in the stream gaging network, will allow the USGS to make streamflow information more available and reliable during flood events. Improvements will include reactivating and adding stations that serve flood warning purposes, reinforcing other flood prone stations, extending rating curves to the 200-year level, adding satellite telemetry for transmitting real-time information from stations, and improving the data delivery systems.

"This Congressional action reflects the high visibility and importance of the stream gaging network to stakeholders across the country," remarked Robert Hirsch, Associate Director for Water of USGS. "The funds will [also] be very important in advancing the development of the National Streamflow Information Program."

The National Streamflow Information Program (NSIP) was proposed in 1999 to develop a nationwide system for producing streamflow information. The program will follow the long-standing principles of the USGS stream gaging network, serving users with data that are freely shared, quality assured, readily accessible for current use and archived for future use. NSIP will consist of an infrastructure of baseline stream gaging stations that are fully supported by federal funds, additional gages supported by cooperatively, along with the analysis and delivery capability to support and maintain fully the federal responsibilities of the national network.

Reprinted from: Minnegrum U of MN Water Resources Center, December 2000.

Survey of 1989 Ground Water Act Available

The Minnesota House of Representatives Research Department has published a 14-page information brief summarizing the results of a survey of a number of individuals who worked on development and implementation of the original 1989 Ground Water Protection Act. The summary includes:

- Accomplishments stemming from the act
- Unfulfilled goals of the act
- Future ground water concerns and recommendations

The information brief was prepared by John Helland, Legislative Analyst, House Research Department, and is available on the web at www.house.leg.state.mn.us/hrd/hrd.htm or from John at 651-296-5039. See also the related summary on page 9 of this newsletter summarizing recommendations from the 2000 MGWA Fall Conference, "What is science telling us about the need for new ground water law in Minnesota?"

MGWA Foundation News

During 2000, the MGWA Foundation:

- Obtained IRS approval to conduct business as a non-profit organization
- Approved Bylaws
- MGWA appointed a board for MGWA Foundation
- Conducted 5 board meetings
- Solicited donations
- Received donations of over \$2,000 passed through from MGWA, and a \$10,000 gift from MGWA earmarked as an endowment.
- Planned a student research contest for the Spring 2001 MGWA conference (4/10/01)
- Future fund raising events are being planned

Newsletter Team Seeks Input on Alternate Format Options

Skyrocketing costs to print and mail the quarterly MGWA newsletter have caused your newsletter team to seriously consider making the newsletter available in electronic format to members by e-mail and/or the MGWA website. In conjunction with our production team at WRI, we have implemented a similar program for the MGWA directory with considerable success.

Briefly, here's how the newsletter distribution would work under the new system. A notification that the newsletter is available would be sent electronically to members with e-mail capabilities on a schedule similar to the one currently used for the printed newsletters (which are mailed in early March, June, September and December). At the same time, a copy would also be posted to a members-only portion of the MGWA website. Members without e-mail or access to the Internet would still be able to receive a printed, black-and-white copy of the newsletter for a nominal fee (as an example, the annual fee to receive a printed copy of the directory is currently \$7.00).

Savings in printing and mailing costs would be used by the association to support ground water education, scholarships, conferences, field trips and other activities sponsored by MGWA. Savings would also be used to help assure that MGWA membership dues remain as reasonable as possible. In addition, members would enjoy the advantages of receiving color copy in a more timely manner than the bulk mailing currently used for the printed newsletter.

We envision that the rest of 2001 will be used as a trial period to receive input from members and work the bugs out of whatever system we implement. Members whose dues are currently paid for 2001 would continue to receive a printed newsletter for the rest of the calendar year.

Beginning with the 2002 renewal period, we would implement the "two-tier" option for receiving the newsletter, as is currently done for the directory. Send your suggestions,

concerns or support for this proposal to the association at 4779 126th St. North, White Bear Lake, 55110, or by e-mail at office@mgwa.org. It's your newsletter and we value your input and ideas.

Four Minnesotans Recognized as 2000 Groundwater Guardians or Affiliates

Groundwater Guardian, an international program of The Groundwater Foundation, Lincoln, Nebraska, empowers citizens to initiate, implement, and maintain groundwater protection projects in their communities. Communities can earn Groundwater Guardian designation for their work to protect local groundwater supplies. Their activities range from education and awareness programs to implementation of wellhead protection plans and local land-use ordinances that protect groundwater. Regional agencies, organizations, and businesses can earn designation as affiliates by supporting the efforts of Groundwater Guardian communities and providing educational materials, technical support, or financial assistance. Minnesota is home to two groundwater guardians and two affiliates for the year 2000. MGWA recognizes the contribution each of them has made to protection of our valuable groundwater resources and thanks them for their efforts.

Selected as Groundwater Guardians for 2000:

Bonnie Holz; Brown-Nicollet-Cottonwood Joint Powers Board; St. Peter

Jarrod Christen; Detroit Lakes Wellhead Protection Committee; Detroit Lakes

Selected as Affiliates for 2000:

Denise Schumacher; LLMP Public Health Services; Marshall

Eric Mohring; Metro Area Ground Water Alliance (MAGWA); St. Paul

Congratulations Bonnie, Jarrod, Denise and Eric!

MGWA Ground Water Education Committee

The Ground Water Education Committee:

Has grown to eight members: Cathy Villas-Horns (MDA), Kevin Powers (Leggette, Brashears & Graham), Dan Wiberg (Epoch Environmental), Erin Eid (MPCA), Chris Elvrum (Metropolitan Council), Mike Schoenberg (Advanced Hydronumerics), Mike Trojan (MPCA), and Jim Lundy (MPCA).

Has made good progress on a list of lesson plans or modules that members can use when presenting ground water concepts to grade school students. These will eventually be posted on the web.

Is developing a list of MGWA members who agree to be listed as part of a "Speaker's Bureau". These speakers may be asked to present basic information on ground water to non-experts.

Is preparing to register MGWA's information booth at the Olson Middle School (North Minneapolis) Earth Day Event (April 2001).

To help on any of these projects, contact Jim Lundy, (651)296-7822 or jim.lundy@pca.state.mn.us.

MGWA Spring Conference "Emerging Issues in Ground Water Technology and Science" April 10

By the time you receive this newsletter, planning will be well under way for the 2001 Spring Conference, "Emerging Issues in Ground Water Technology and Science", to be held at the Earle Brown Center on the University of Minnesota St. Paul Campus, April 10, 2001. Notification and registration information will be sent by e-mail and be available in printed form early in March. As a part of the conference, papers and posters from students in geological science departments of local colleges and universities will be judged. This promises to be one of our biggest and best conferences yet, so mark your calendars now and watch for registration information.

This Newsletter brought to you by:

Tom Clark, Editor-In-Chief
Steve Robertson
Jan Falteisek
Jim Lundy
Vacancy

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steve.robertson@health.state.mn.us
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jim.lundy@pca.state.mn.us
call Tom Clark if interested

Remaining MGWA Newsletter Deadlines for 2001

Issue	Copy to Editor	Copy to Publisher
June (Vol.20, No. 2)	05/11/01	05/18/01
September (Vol. 20, No. 3)	08/10/01	08/17/01
December (Vol. 20 No. 4)	11/09/01	11/16/01

USGS Offers Online Access to Water-Quality Data

A new online data warehouse of 6.5 million records enables water resource managers, scientists, and the public to find data about 2800 stream sites and 5000 wells in 46 states, according to the U.S. Geological Survey.

The data were collected by the USGS National Water Quality Assessment (NAQWA) Program beginning in 1991 in 36 basins around the country, which are the basic study units of the NAWQA effort (see water.usgs.gov/nawqa). The data warehouse has been in use by USGS researchers since November 1999. Data from 15 additional study units, which began in 1997, will be incorporated later.

Data in the warehouse are from surface and ground water sources, not from finished tap water. The data include about 15,000 pesticide and volatile organic compound samples and about 26,000 nutrient samples collected from the water column, as well as about 1200 samples from bed sediment and aquatic animal tissue, which were analyzed for trace elements and organic compounds that do not dissolve in water easily.

Most pesticide, sediment and tissue samples were analyzed for more than 40 compounds at the USGS National Water Quality Laboratory in Denver, Colorado.

Site, well, and network (groups of sites with similar characteristics or sampling regime) information and descriptive variables such as land use

Daily stream flow and temperature information for repeated sampling sites

Chemical concentrations in water, sediment, and aquatic organisms

Data can be compiled and summarized for geographic areas, such as for one or multiple states, counties, basins, or NAWQA study units. Examples of summaries include:

Concentrations for groups of chemicals, such as pesticides, detected in streams, streambed sediment/aquatic tissue, and/or wells

Samples where the concentration of a specific chemical of your interest exceeds some value such as a water quality standard

Counts of samples for one of the above examples

You can visit the USGS Water Quality Data Warehouse Web site at water.usgs.gov/nawqa/data.

For further information, contact Sandy Williamson, 1201 Pacific Ave., Tacoma, WA 98402; (253)428-3600, ext. 2683; fax (253)428-3614; or email: akwill@usgs.gov.

Reprinted from GWMR, Fall 2000

MGWA Board Meeting Minutes

November 9, 2000

Location and Time: Black Bear Crossing, 831 Como Ave., St. Paul, MN, 7:30 a.m.

Attending: Jim Lundy, President; Jim Stark, President-Elect; Lee Trotta, Treasurer; Jan Falteisek, Secretary; Jeanette Leete, Sean Hunt, WRI; Tom Clark, Newsletter Editor.

Approval of Minutes – Jim Lundy called the meeting to order at 7:35 a.m. Minutes for the regular Board meeting held October 6, 2000 were approved.

Treasurer's Report – A draft fall conference financial report was distributed. Lee reported that the CD is due on December 7 and then summarized current money market rates. The Board approved transferring the proceeds of the CD to the Minnesota Ground Water Association Foundation to endow the Foundation.

Newsletter – The newsletter team met on November 7. The officer ballot and a membership survey will be inserted and mailed with the newsletter. The survey will need to be modified to address Foundation activity. Members will be reminded in the newsletter to renew their membership on-line. The December newsletter will include a list of new members in 2000. The newsletter will include a column summarizing committee activities in 2000.

Membership Committee – The recruitment letter is awaiting sending. Should be sent out by the December Board meeting.

Corporate Membership – Several approaches were discussed, such as including Foundation sponsorship, and scenarios where corporate membership is coupled or decoupled from advertising. The proposed 2001 newsletter advertising rates were approved. The corporate membership issue was deferred to the membership committee for further discussion and preparation of an updated proposal for future Board consideration.

Web Page – Sean reported that he had created a write up of the fall field

trip for the web site. Sean had also created a fall conference and registration page.

MGWA Foundation – The next scheduled meeting is December 8th. The MGWA renewal form should include a request for Foundation donations.

Ground Water Education Committee – The committee met October 12. The committee is in the process of creating a notebook of materials for teaching.

Fall Conference – Sean brought preliminary results from the conference evaluations. Results were generally very positive. Jim L. is collaborating with Dan Stoddard to write up the results of the small group discussion. The small group results will be reported in the newsletter. Tom Clark will review and edit the results for the newsletter. The draft will be placed on the web page through January 15 for further comment and evaluation. Lessons learned from the conference were discussed, including not scheduling the conference at a major national election or at the start of the deer-hunting season. When scheduling the Earle Brown center, we should ask who is also scheduled at the center that day. Tentative dates for the spring conference were suggested (4/20, 4/27, and 5/4).

Spring Conference – Jim Stark noted the MDH Water Well conference for the spring has been cancelled. The MGWA could pick up this conference niche. Jennie suggested two conferences. Tom suggested involving the MWWA and the MN driller's group.

Karst Workshop – Jim L. has prepared a letter of support for the workshop. The letter was revised and approved and will be sent.

2001 Officer Nominations – There is currently one nomination for each position. Bio info is needed for each candidate.

New business – The WRI contract will expire at the end of 2000. WRI will bring a draft contract to the December Board meeting.

Meeting adjourned at 9:00 a.m.

December 7, 2000

Location and Time: Black Bear Crossing, 831 Como Ave., St. Paul, MN, 7:00 a.m.

Attending: Jim Piegat, Past-President, Jim Lundy, President; Jim Stark, President-Elect; Lee Trotta, Treasurer; Jan Falteisek, Secretary; Jeanette Leete, Sean Hunt, WRI; Tom Clark, Newsletter Editor.

Approval of Minutes – Jim Lundy called the meeting to order at 7:15 a.m. Minutes for the regular Board meeting held November 9, 2000 were approved with corrections.

Treasurer's Report – WRI provided an updated balance sheet. Lee Trotta reported that funds were transferred from the CD to the checking account for subsequent transfer to MGWAF. Actual transfer will wait until the MGWAF Board discusses the transfer. The fall conference realized about \$3,800.

Newsletter – The December newsletter was distributed at the board meeting. Jim Stark requested seeing the recent Wisconsin Ground Water Assoc. issue that had the GIS focus. The March issue will include Year 2000 financial summary and introduction to new officers. Jennie noted the last printing cost \$1,022. Jennie suggested the board consider ways to control printing costs. Options might include two levels of membership and more distribution by e-mail and PDF format. Jennie also noted that postage costs are increasing. The March newsletter issue will include an article on newsletter costs and future options. Newsletter costs will be discussed further at the next board meeting.

Membership Committee – Membership renewal notices by e-mail were sent out. Paper notices will be sent in a couple of weeks. The student recruitment poster and cards were printed and will be sent shortly.

Advertising – Jennie noted that many newsletter ads had the wrong area codes.

Web Page – The web site has been set up to handle this year's on-line membership renewals.

— continued on next page

MGWA Board Meeting Minutes, cont.

Ground Water Education Committee – The committee is hoping to meet again soon.

WRI Contract – Minor changes were suggested to the draft previously distributed by Jennie. Jennie will prepare a revised text and bring to the January meeting.

House Ground-Water Subcommittee – Jim L. noted that he will be speaking before the subcommittee this afternoon.

Short Course Scholarship – Jim L. reported a message from Steven Scott, Environmental Resources, regarding scholarships for two January short courses. Steven noted that one student had applied.

Spring Conference – The conference committee includes Jim Stark, Jennie, and Jan. The conference may run concurrent sessions to include topical sessions for well drillers. Someone from the MDH will need to be on the committee. Jennie will check with the Earle Brown Center for available dates. Jennie brought a sample of a scoring sheet for a student poster competition. Jennie also brought a sample student program from UW-River Falls.

Fall Field Trip 2001 – The AIPG is the lead for 2001 and a trip to the Brainerd area is planned.

STATEMAP Program – Jim P. reported that the Statemap committee met in October to develop recommendations for mapping. Jim P. reviewed the priorities. A summary of the Statemap program was given to Tom Clark for the newsletter. Jim Piegat will continue on the Statemap committee.

WGWA contact – The Wisconsin Ground Water Association contacted WRI regarding MGWA procedures for dues renewal. Jennie explained to them our use of our web site and credit card renewals.

Birdsall-Dreiss Lecture – The board voted to contribute \$50 for non-alcoholic refreshments at the lecture today. Jim P. will take the check and take notes for the newsletter.

Meeting adjourned at 8:20 a.m.

January 4, 2001

Location and Time: Dunn Bros., Hamline and Co. Rd. B., Roseville, MN, 7:30 a.m.

Attending: Jim Lundy, Past-President; Jim Stark, President; Lee Trotta, Treasurer; Eric Hansen, Treasurer-Elect; Jan Falteisek, Secretary; Jeanette Leete, Sean Hunt, WRI; Tom Clark, Newsletter Editor.

Approval of Minutes – Jim Stark called the meeting to order at 7:35 a.m. Minutes for the regular Board meeting held December 9, 2000 were approved.

Thanks and Welcome – Jim Stark expressed the Board's thanks to outgoing Board members, Jim Piegat and Lee Trotta, and welcome to incoming Board members, Robert Caho and Eric Hansen.

Treasurer's Report – Lee Trotta reported on the current financial status. Jeanette Leete provided updated financial statements. Lee reported that the transfer of \$10,000 to MGWAF was delayed but will be accomplished by end of the week. As outgoing Treasurer, Lee will be turning over all financial records to Treasurer-Elect Eric Hansen.

Motion: Jan moved and Jim Lundy seconded the motion that Treasurer duties, responsibilities, and signatory power be transferred from outgoing Treasurer Lee Trotta to Treasurer-Elect Eric Hansen, effective immediately. Motion passed unanimously.

Before the next monthly meeting, Lee Trotta and Eric Hansen will discuss the treasurer's duties and additional investment options to be reported at the next meeting.

Membership Committee – The student recruitment poster is nearly ready to mail. Each packet will include an insert from the MGWA Foundation, which will be finalized at the MGWAF meeting January 5, 2001. It was reported that about 130 members have already renewed and that the newsletter is exchanged with 13 entities. Paper renewal notices were sent the end of December. The membership committee currently includes Jim L. Jan F. Lee T., and Sean Hunt.

Advertising – Jennie said that more work is needed to raise advertising revenues. It was suggested that member Andrew Nichols be contacted for additional ideas and suggestions.

MGWA Foundation – Jim Lundy reported the Foundation is meeting January 5th. At their previous meeting the Foundation Board discussed how the student competition should be conducted.

Ground Water Education Committee – Jim Lundy reported the current committee members were Erin Eid, Dan Wiberg, Kevin Powers, Cathy Villas-Horns, Mike Schoenburg, Chris Elvrum and himself. There was some discussion on further goals for the committee. Jim Stark suggested a speaker's bureau for general audiences.

Election Results – Ballots have been tabulated and Robert Caho is the new President-Elect and Eric Hansen is the new Treasurer. Jim Stark will call Robert Caho with the election results.

Newsletter – Jennie has summarized historical newsletter preparation costs, which shows costs have just about doubled since 1999. In the future, as a way to control costs, the newsletter may be published primarily as an e-zine, similar to the Membership Directory. Tom Clark reported the team will meet next week. A GIS in Ground Water focus is planned.

House Ground-Water Subcommittee – Jim L. noted that the Fall Conference results summary will be open to comment until January 15, 2001. There was some discussion about what format to use for the final version, which may be ready for the March newsletter issue.

Spring Conference – No date is set yet, but Jennie will check on availability at the Earle Brown Center. The rough topic is Water Well Technology. Jim S. will contact Ed Schnieder at MDH regarding content. Jim S. will draft a rough list of topics and circulate. Ideas will be needed for the next board meeting. As soon as known, the date and content will need to be included in newsletters distributed

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MGWA Board Meeting Minutes, cont.

to well drillers. Sean H. will send the comments from the last conference to the Board.

Fall Field Trip 2001 – Jim Stark will review the status for the next newsletter. Oct. 13-14 was suggested to coordinate with the AIH conference Oct. 14-16.

WRI Contract – The 2001 WRI contract was approved.

Earth Day – Jim Lundy reported that the MGWA was invited to participate in Earth Day at Olsen Middle School on April 19th. Jim Lundy will fill out application and submit.

MGWA History – Jim Stark asked if a history of the MGWA had been written. None of the board members present recalled such a document. Jim S. suggested it might be worthwhile to develop one in preparation for the 20th anniversary of the organization.

Board Member Duties – Jim S. asked if position descriptions were available for each of the board positions. Jim L. said a brief listing had been prepared.

Children’s Water Festival – Jan F. presented a thank you for support received from the Children’s Water

Festival. Jim L. said that a cable company had done a piece on the festival and that a video clip will be sent.

Next meeting – The next Board meeting will be Thursday February 1, 2001, 7:30 a.m., at Dunn Bros. at Co. Rd. B and Hamline.

Meeting adjourned at 8:55 a.m.

New from USGS

Water-quality data from lakes and streams in the Grand Portage Reservation, Minnesota, 1997-98. OFR 00-364. Minnesota. By T.A. Winterstein, 16 pages.

The Grand Portage Reservation is located in northeastern Cook County, Minnesota. In 1997 and 1998 the U.S. Geological Survey (USGS) conducted a study, in cooperation with the Grand Portage Band of Chippewa, to determine the quality of water in selected inland lakes and streams in the Reservation. The USGS collected and analyzed water from two streams, two wetlands, and four lakes. Water samples were collected in the spring and fall of 1997 and 1998. In addition, samples of

bottom sediments were collected from two of the four lakes in 1998. The purpose of this report is to present the data collected by the USGS from the study during 1997-98. Water-quality data include temperature, pH, specific conductance, dissolved oxygen, alkalinity, and concentrations of major ions, nutrients, and trace metals. Lake sediment data include concentrations of trace metals and selected organic compounds.

Nutrients and suspended sediment in snowmelt runoff from part of the Upper Mississippi River Basin, Minnesota and Wisconsin, 1997. WRI 00-4165. Minnesota, Wisconsin. By J.D. Fallon R.P. McNellis, 23 pages.

The U.S. Geological Survey sampled snowmelt runoff from 42 stream sites during March and April 1997 in part of the Upper Mississippi River Basin, Minnesota and Wisconsin, to characterize nutrient and suspended-sediment concentrations, yields, and loads. Ancillary data from 12 sites provided data to estimate constituent loads delivered during snowmelt and 1997. The snowmelt period contributed from 1 to 50 percent of 1997 annual loads of total nitrogen, total phosphorus, and suspended sediment at small stream sites, and 17 to

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If you are reading this newsletter second-hand, we’d like to take this opportunity to invite you to become a member of **MGWA** for **2001**. Annual dues are \$25 for professional members and \$15 for students. Members are entitled to purchase a paper copy of the annual membership directory for \$7; an electronic version will be available on the website for paid members. Tax deductible contributions to the MGWA Foundation scholarship fund 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.*

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70 percent of annual loads at mainstem river sites. Small streams in agricultural areas transported the greatest proportions of annual loads during snowmelt. Snowmelt from urban streams transported the least proportions of annual loads. Agricultural streams had significantly greater median yields ($p < 0.025$) of dissolved nitrite, nitrate, phosphorus, orthophosphate, total nitrogen, and total phosphorus than forested sites, and significantly greater median yields ($p < 0.025$) of dissolved nitrate and orthophosphate than all other land uses. In forested areas, yields of suspended sediment and all nutrient forms were significantly greater ($p < 0.05$) for streams draining impermeable deposits than permeable deposits.

Water quality of lakes in Voyageurs National Park, northern Minnesota, 1999. WRI 00-4281. Minnesota. By G.A. Payne, 12 pages.

Water-quality samples were collected during July 1999 from selected lakes

and bays, and the mouths of two rivers that flow into Voyageurs National Park in northern Minnesota. Results of laboratory analyses and field measurements of chemical and physical properties were compared to similar data collected during 1977-83. Water-quality data were evaluated for changes in specific conductance, alkalinity, nutrients, trace metals, bacteria, and trophic state.

Specific conductance and alkalinity were similar to the 1977-83 period in much of the Park, but in some lakes and bays these properties may have been influenced by above normal runoff during summer 1999.

Fecal-coliform bacteria colony counts were within guidelines for water-contact recreation. Nitrite plus nitrate nitrogen concentrations generally were lower throughout the Park and total phosphorus concentrations were lower in Kabetogama Lake and Black Bay relative to

1977-83. Concentrations of most trace metals were lower compared to 1977-83. Trophic state indices, based on chlorophyll a concentrations, indicated lower algal productivity throughout the Park.

The largest changes in algal productivity, relative to 1977-83, were in Kabetogama Lake, Black Bay, and Sullivan Bay.

These publications are available from the U.S. Geological Survey, Branch of Information Services, Box 25286, Denver Federal Center, Denver, CO 80225.



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MGMAP Proposals Funded for 2001

The Minnesota Geologic Mapping Advisory Panel (MGMAP) has received funding for three initiatives, beginning July 1, 2001. The Minnesota Geological Survey (MGS) will do the following mapping projects:

Mapping Project 1—Quaternary Mapping of the Faribault 30 x 60' Quadrangle

This project will involve digital compilation at the 1:100,000 scale of the Faribault area to compliment previously prepared Quaternary compilations of the Anoka, Stillwater, Hastings, St. Paul and Rochester sheets and the current work on the St. Cloud sheet. The Faribault area represents the southwestern portion of the "urbanizing crescent" from St. Cloud to Rochester, and this effort will provide useful data to help guide development. Issues here include expansion of gravel and dolomite mining, non-point source pollution of the Minnesota River and tributaries, feedlot siting and construction, and residential development.

Mapping Project 2—Bedrock and Quaternary Mapping of 3 North Shore Quadrangles

This project involves geologic mapping in the three North Shore 7.5' quadrangles closest to Duluth: Lakewood, French River and Knife River. This corridor is undergoing intense development pressure in an area that is both hydrogeologically sensitive and adjacent to a national treasure, Lake Superior. The mapping will assist state and local governments in making informed land use decisions that have the potential to impact the ground and surface water resources of the Lake Superior watershed. Quaternary mapping on this scale has never been done in this area, so this mapping should serve as a foundation for future such efforts up the North Shore.

Mapping Project 3—Bedrock Mapping in the Basal Duluth Complex

This project involves bedrock mapping of the Babbitt NE 7.5' quadrangle and will support delineation of and exploration for magmatic copper-nickel-platinum group metal accumulations associated with the base of the Duluth Complex. The area is of

much interest to the mining industry.

The three projects are to be completed by June 30, 2002. The MGWA would like to thank one of its past-presidents, Dr. James Piegat for representing the association on the five-member MGMAP panel. The MGWA Board voted to approve Jim's continuing representation for 2001. Jim, thanks for bringing your geologic expertise and concern for ground water protection to the table to assist in this important process.

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