

# Minnesota Ground Water Association

www.mgwa.org

## Newsletter

September 2011  
Volume 30, Number 3

### Featured:

- ◆ President's Letter, page 1
- ◆ Taking the Pulse of the Membership: Salary Survey, page 1
- ◆ Subterranean Wonders, page 10
- ◆ Mt. Simon Aquifer Monitoring, page 13



MGWA President  
Mindy Erickson

### Inside:

Member Award . . . . .	2
Member News . . . . .	2
Professional News . . . . .	3
Agency News . . . . .	4
Abbreviations and Acronyms . . . . .	4
Question of the Quarter . . . . .	12
Technical Articles . . . . .	13
Call for Nominations . . . . .	16
Reports and Publications . . . . .	18
MGWA Board Minutes . . . . .	20
MGWA Foundation . . . . .	22

### President's Letter

After two years of planning, the Geological Society of America's 2011 annual meeting is upon us! Welcome to Minneapolis, GSA 2011 attendees, from the Minnesota Ground Water Association and the GSA 2011 local planning committee.

I was initially hesitant to actively participate in the local planning committee for GSA 2011. I greatly feared becoming utterly overwhelmed with the obligation. Local planning committee chairperson Harvey Thorleifson more than kept his promise to me, though – that he was recruiting enough volunteers so no one person would be overwhelmed. (Thanks Harvey!) Volunteering on behalf of GSA 2011 has been enormously rewarding, both personally and professionally. I haven't regretted for a moment (well, maybe just *one* moment) joining

the local planning committee.

Several GSA 2011 sessions and events are particularly significant to me. First, at a luncheon on October 10, I will be presenting Dr. Otto Strack with MGWA's Outstanding Service Award for his decades-long service to University of Minnesota students, the groundwater community internationally, and the citizens of Minnesota. The luncheon will be preceded by a technical session devoted to analytic groundwater modeling.

Second, three other technical sessions are particularly near-and-dear to my heart. One session (T89) relates to field studies of natural attenuation, and the second (T97) to understanding groundwater/surface water interactions. Both natural attenuation and groundwater/surface water interactions were

— continued on page 3

### Taking the Pulse of the Membership: Results of the First MGWA Salary Survey – Part One

by Kelton Barr, President-Elect

This spring the MGWA initiated its first-ever salary survey of its members. In all, 299 of the 570 members participated, or 52.5 percent.

This is a much higher percentage than other previous salary surveys carried out in our industry. Such a healthy participation should make the results both representative and meaningful. Thank you, all, for participating!

The results have been tabulated, and several of the findings will be reported in two installments in the *MGWA Newsletter*. This article will describe the educational levels and types of employment

of our membership and the effects of these on levels of compensation as determined from the survey results. Please note that the tables referenced in this article and higher resolution versions of the figures can be found on the MGWA website for members ([mgwa.org/newsletterextras](http://mgwa.org/newsletterextras)).

— continued on page 4

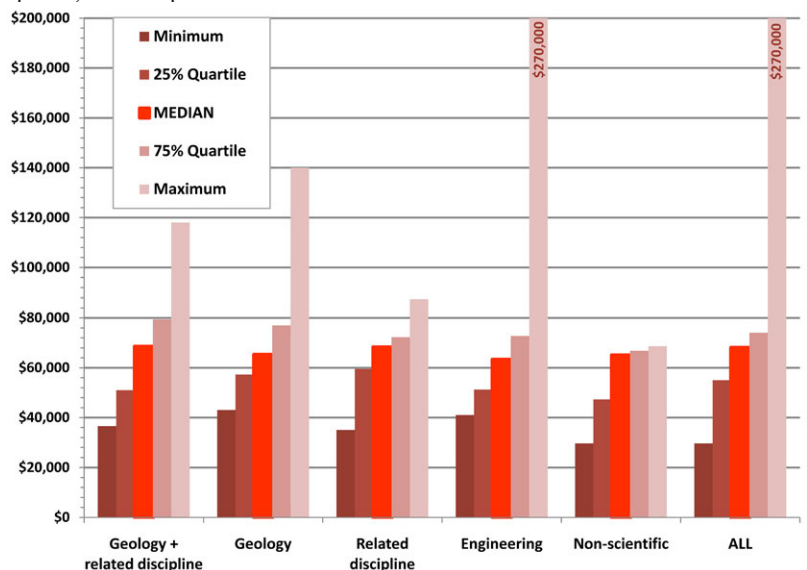


Figure 1: Annual salary — Bachelor's degrees

## MEMBER AWARD

### Harvey Thorleifson Named GSA Fellow

Society Fellowship is an honor bestowed on the best of our profession by election at the spring GSA Council meeting.

GSA members are nominated by existing GSA Fellows in recognition of their distinguished contributions to the geosciences through such avenues as publications, applied research, teaching, administration of geological programs, contributing to the public awareness of geology, leadership of professional organizations, and taking on editorial, bibliographic, and library responsibilities. Learn more at [www.geosociety.org/members/fellow.htm](http://www.geosociety.org/members/fellow.htm).



GSA's newly elected Fellows will be recognized at the 2011 GSA Annual Meeting Presidential Address and Awards Ceremony on Sunday, 9 October, at the Minneapolis Convention Center. Here is what Dr. Thorleifson's nominator had to say:

*Harvey Thorleifson, Minnesota Geological Survey, "has distinguished himself as a researcher in glacial geology and mineral resources, professor of geology and geophysics, state geologist of Minnesota, officer in several professional societies in the U.S. and Canada, 2011 GSA Annual Meeting general chair, Trustee of GSA Foundation, and member of the One Geology Management Committee."* —Vincent Matthews.

— reprinted by permission of the GSA Journal

## MEMBER NEWS

### Eric Tollefsrud joins Geosyntec

**Eric Tollefsrud** recently accepted a position with Geosyntec Consultants in their Minneapolis office. At Geosyntec, Eric is serving as an Associate Hydrogeologist in the firm's Remediation Practice where he works alongside Geosyntec's clients from the public and private sectors to help implement effective and technologically sound solutions to address Superfund, RCRA, and brownfield challenges.

### William M. Gregg joins Summit Envirosolutions, Inc.

**William M. Gregg, P.G.** has joined the Environmental Resources Management staff at Summit Envirosolutions, Inc. Highly regarded for his national expertise at manufactured gas plant sites and other coal tar and creosote sites, Mr. Gregg spent over 31 years of his 33-year career at AECOM performing a variety of environmental studies and remedial projects worldwide.

"We are honored to welcome Bill Gregg to our company," said Summit President and Chief Executive Officer John E. Dustman. "His extensive experience as a business strategist and proven track record of driving top performance in the arena of environmental remediation is a

great fit for Summit."

Summit Envirosolutions is an environmental consulting firm in St. Paul that provides specialized service in cultural resource management, environmental assessment and remediation, Geoprobe® operation, water resource management, and associated data management. Mr. Gregg brings over 33 years experience in completing environmental assessment and remediation projects worldwide to his new position at Summit. Mr. Gregg has served as an expert witness on cases involving the allocation of costs at manufactured gas plant sites and at other Superfund sites, and provided expert testimony for insurance recovery and other matters.

### Chris Elvrum joins MDH

**Chris Elvrum** began working at the Minnesota Department of Health on June 10, 2011 as the Well Management Section Manager. In this role, he has the overall management responsibility for the section which administers and enforces the statutes and rules regarding the construction, repair, and sealing of wells and borings. The section manages compliance through contractor licensing, minimum standards for construction, repair and sealing, an active inspection and compliance program, and administrative processes for approving, tracking and documenting well work.

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Visit [www.mgwa.org](http://www.mgwa.org) for MGWA information between newsletters and to conduct membership and conference transactions.

### Newsletter Deadlines

Issue	Due to Editor
December '11	11/05/11
March '12	02/03/12
June '12	05/04/12
September '12	08/03/12

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## PROFESSIONAL NEWS

### Changes to PDH Requirements Proposed

The MN Board of Architecture, Engineering, Land Surveying, Landscape Architecture, Geoscience and Interior Design has drafted changes to the statutes regarding continuing education requirements along with a few other statutory updates. The proposed legislation is expected to be heard in the next legislative session in 2012.

The proposed language regarding continuing education and ethics as drafted requires licensees and certificate holders to dedicate two of their minimum of 24 professional development hours (PDH) to professional ethics per biennial renewal. The ethics hours must have been earned during the biennium to which they are applied and shall not be used toward carryover.

The above language could certainly change as it goes through the legislative process.

### President's Letter, cont.

not well-understood at the beginning of my career. Although both topics are active parts of my current research, the old ad says it well: 'we've come a long way, baby.' The third session (T204) relates to naturally occurring trace elements (e.g., arsenic), which has been one of my long-time research interests.

Finally, I was invited to join a panel of women geoscientists at a mentoring event sponsored by Subaru of America Inc. and supported by Shell, the Association for Women Geoscientists, and EnPro Assessment Corp. I have benefited greatly from myriad people willing to formally or informally mentor me as I built a successful and rewarding science career. Although it still surprises me that I am already among the gray-haired, I am pleased to be able to return the mentoring favor when I can.

On the notes of mentoring and volunteering, the season of MGWA Board elections is right around the corner. As I said at the spring conference, my time on the MGWA board – and especially this year as president – has been much more fun and much less time-consuming than I expected. MGWA is a member-driven, volunteer organization that continues to thrive and be relevant because of the breadth of our membership and the time that our members are willing to give to leading the organization. Please consider volunteering to run for a board office this fall. The call for nominations is on page 16. Contact me or our President-Elect, Kelton Barr ([kbarr@braunintertec.com](mailto:kbarr@braunintertec.com)), if you want to know more about volunteer opportunities.

Enjoy GSA 2011 and have a wonderful autumn.

### Geological Society of America 2011, October 9 – 12, 2011

The GSA 2011 conference will take place at the Minneapolis Convention Center October 9 through 12. In addition to several days of technical sessions, numerous field trips and short courses are offered.

Visit the GSA 2011 website for detailed information on the meeting and on registration: <http://www.geosociety.org/meetings/2011/>.



### AMEC Acquires MACTEC

AMEC, the international engineering and project management company, announced on May 18, 2011 that it has agreed to buy MACTEC, a leading US engineering and environmental services company. Headquartered in Georgia, MACTEC has some 2,600 employees, mostly highly skilled technical professionals, and 70 offices which are mainly in the eastern part of the US. The company provides a similar, wide range of services to AMEC's existing Earth & Environmental business, including environmental planning, assessment and remediation, infrastructure engineering, water resources, and construction support services.

### 2011 MGWA Board

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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.

## MGWA's Corporate Members for 2011

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Northeast Technical Services

Links at [www.mgwa.org](http://www.mgwa.org)

## Abbreviations and Acronyms

- ◆ ASTM – American Society for Testing and Materials
- ◆ DNR – Minnesota Department of Natural Resources
- ◆ MDA – Minnesota Department of Agriculture
- ◆ MDH – Minnesota Department of Health
- ◆ MGS – Minnesota Geological Survey
- ◆ MPCA – Minnesota Pollution Control Agency
- ◆ USEPA or EPA – United States Environmental Protection Agency
- ◆ USGS – United States Geological Survey

## AGENCY NEWS

### DNR and MPCA Acquire Aquarius Software

by Greg Kruse, Minnesota DNR

Over the past year, the DNR and MPCA did an exhaustive search to acquire a new data system to house continuous stream flow and groundwater data. Aquatic Informatics of Vancouver, Canada was awarded the contract and will be installing its software “Aquarius” early this fall (2011). The DNR and MPCA have an existing cooperative stream flow data management system used to store, compile, and send data to a state website available to the public. The new system will have additional features and house the combined groundwater level and stream flow data from both agencies. The software and the agreement with the company will allow other state and local agencies to also use the software and join the cooperative data system. The long term goals in the combining of these data sets and future data collection efforts are to provide consistent and standardized data formats, better quality control, and “one stop shopping” for surface and groundwater quantity data in Minnesota.

### Salary Survey Results, part 1, cont.

#### Education Levels of Membership

The respondents were asked to describe their educational background, with 281 of the 299 (94.0% of all respondents) reported having a high school diploma or equivalent, and 294 (98.34% of all respondents) having college degrees. Looking further at the college graduates, one (0.3% of respondents) had a two-year degree, 133 (44.5%) had a bachelor's degree, 141 (47.2%) had a master's degree, and 20 (6.7%) had a doctoral degree. Of these, two-thirds reported salary information; for the remainder of this article those reporting salary information will be called “respondents.”

This information on the highest degree(s) attained is summarized by annual salary (Table 1), employer-provided benefits (Table 2), and paid time off (Table 3) for the highest degree(s) attained (some have more than one bachelor's or master's degree). For these tables, annual salary includes base salary, bonuses, and paid overtime. Employer-provided benefits include employer payments for pensions, 401(k) or 403(b) plans, medical/dental insurance, life/accident insurance, and employer-provided perks (*e.g.* cars, memberships, cell phones). Paid time off includes vacation, sick leave, or other leave. For additional insight, these educational categories are further divided into five groups for salary and benefit results: geology degree plus a degree in

### National Groundwater Monitoring Network Pilot Project Update

Technical reports describing the results from all five pilot projects for a proposed U.S. National Groundwater Monitoring Network and a beta version of the data portal are now available online. The technical reports include all five pilot study reports and a draft summary report. The five pilot project partners are Illinois-Indiana, Minnesota, Montana, New Jersey, and Texas. The Minnesota pilot study was conducted jointly by the DNR and the MPCA.

The reports and data portal are located on the Advisory Committee on Water Information's website at <http://acwi.gov/sogw>

— Sherri Kroening, MGWA Newsletter Team

a related scientific discipline, geology degree, related scientific discipline, engineering degree, and a non-scientific degree.

#### Results

Not too surprisingly, the more respondents in a particular group of educational level attained, the greater is the ranges of salaries, indicating that individual employment situations ultimately determine salary levels. However, the median salaries do increase with increasing levels of education. The median salaries for bachelor's, master's, and doctoral degrees were \$68,000, \$73,539, and \$82,000, respectively. This relationship was also found with benefits, with \$6,100, \$9,368, and \$12,556, respectively. Paid time off (PTO) also had higher results for advanced degrees, with 27.0, 33.5, and 33.0 days, respectively.

The salary information is further portrayed in Figures 1 through 3 which show the quartile information for each sub grouping by major for each of the different college degrees attained. For holders of bachelor's degrees there are only small differences between the four categories of scientific majors, with half of the bachelor-degreed respondents earning salaries more than \$50,000 and less than \$80,000 with median salaries in the low- to upper-\$60K range. Respondents with non-scientific bachelor's had a similar median salary of \$65,000,

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Salary Survey Results, part 1, cont.

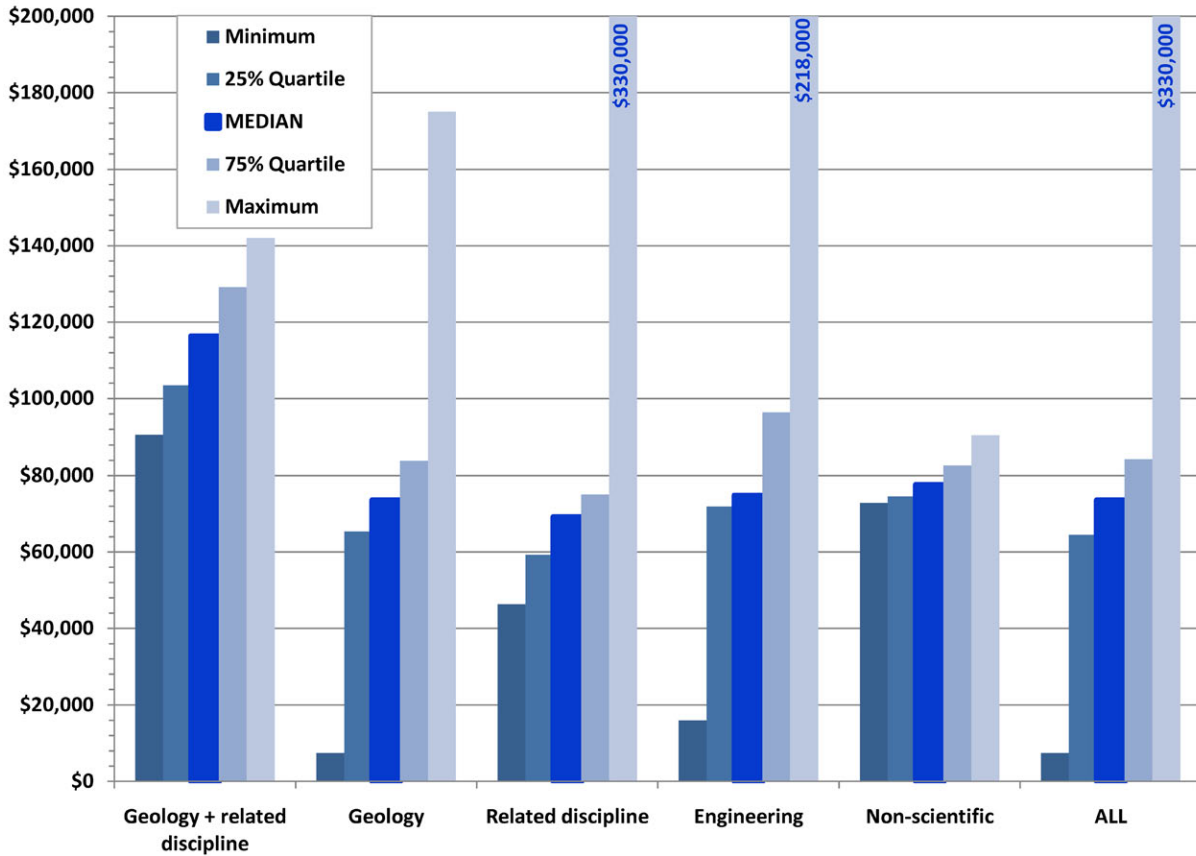


Figure 2: Annual salary — Master's degrees

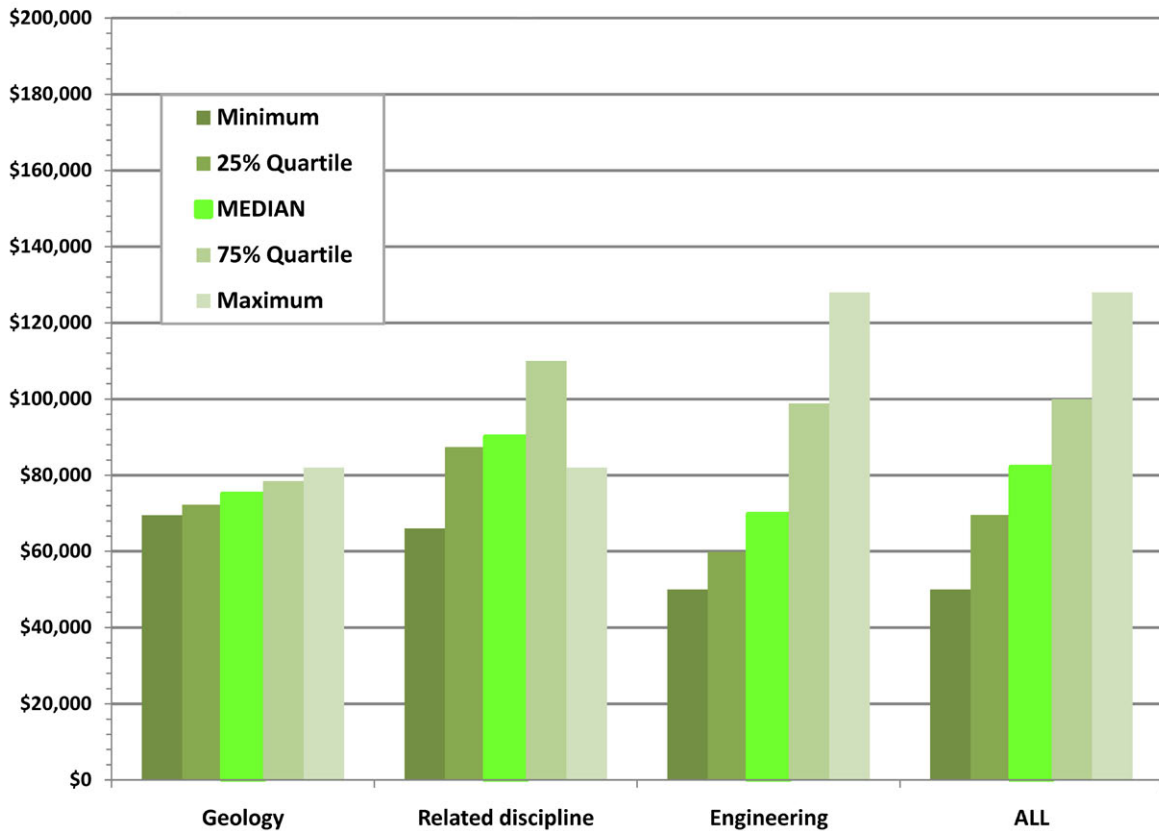


Figure 3: Annual salary — PhD degrees

## Salary Survey Results, part 1, cont.

but the range for half of the respondents was somewhat lower, from more than \$47,000 to less than \$67,000.

For holders of master's degrees there is an apparent advantage to having both a master's in geology as well as in a related scientific discipline with a median salary of \$116,282 and half of the multiple-master's respondents having salaries between \$103,000 and \$130,000. The other subgroups with a master's degree had median salaries between \$69,000 and \$78,000 and half of the respondents having salaries between \$59,000 and \$97,000.

Finally, given the smaller numbers of respondents with doctoral degrees, the quartile differences between the subgroups do not differ substantially, with median salaries from \$70,000 to \$90,000 and half of the salaries between \$59,000 and \$110,000. However, these ranges do indicate some salary benefit in having a doctorate over the other college degrees. However, the total range (*i.e.* minimum to maximum) is smaller for doctorate respondents than the ranges are for both master's and bachelor's respondents; this may be reflecting a different mix of the types of employers.

### Types of Employment of our Membership

Respondents to the survey were given a variety of types of employers to describe their current and past places of employment as a groundwater professional. Ten of these employer groups (education, research, federal, state, county, city, regional, other public, and non-profit) will be collectively referred to as Public

Sector groups; 150 respondents were employed in these groups. Five employer groups (consulting, lab/testing, mining/construction, drilling, and other private) will be collectively referred to as Private Sector groups; 110 respondents were employed in these groups. There were also two other categories: part-time or semi-retired (which had 5 respondents) and unemployed (1 respondent).

### Results

The distribution of the respondents among these employer groups is shown in Figure 4. As can be seen, the largest groups are State employees (104) and Consulting Firm employees (94). All of the other employer groups are composed of less than a dozen respondents with 45 respondents in the other seven Public Sector groups and 16 in the other four Private Sector groups. The salary, benefits, and PTO results for each employer group are summarized in Table 4. Also included on this table are a summary of the number of respondents and their total professional experience. The information from Table 4 is also portrayed in Figures 5 through 8.

The professional experience of the membership as reflected by the respondents is impressive, with the median experience of the employer groups ranging from 14.5 to 44 years. The median experience within the two largest employer groups, State and Consulting Firms, is 23.5 and 21.0 years, respectively.

The median salaries range from \$60,000 to \$102,900. The top three salary medians are Mining/Construction (\$102,900), Federal (\$87,529), and Other Private (\$81,500). The bottom three salary medians are Research (\$60,000), County (\$64,320), and State (\$68,257).

The median benefits range from \$23,400 to \$6,000. The top three benefits medians are Regional (\$23,000), Mining/Construction (\$17,500), and Education (\$17,300). The bottom three benefits medians are Consulting Firms (\$6,000), Other Public (\$6,445), and Other Private (\$6,529).

The median PTOs range from 48.0 to 20.0 days. The top three PTO medians are Research (48.0 days), City (40.0 days), and Federal (39.0 days). The bottom three PTO medians are County (20.0 days) and Consulting Firms and Other Private (both 23.0 days).

### Public vs. Private Sector

The comparison of the nine Public Sector employer groups and the five Private Sector employer groups is summarized at the end of Table 4. For this comparison, the quartile results for all employer groups within the sector have been averaged. In addition, the comparison of the salaries for the Public and Private Sectors is portrayed on Figure 9. Because the numbers of respondents from the Public Sector and Private Sector are 95 and 89, respectively, these two sectors are fairly evenly represented.

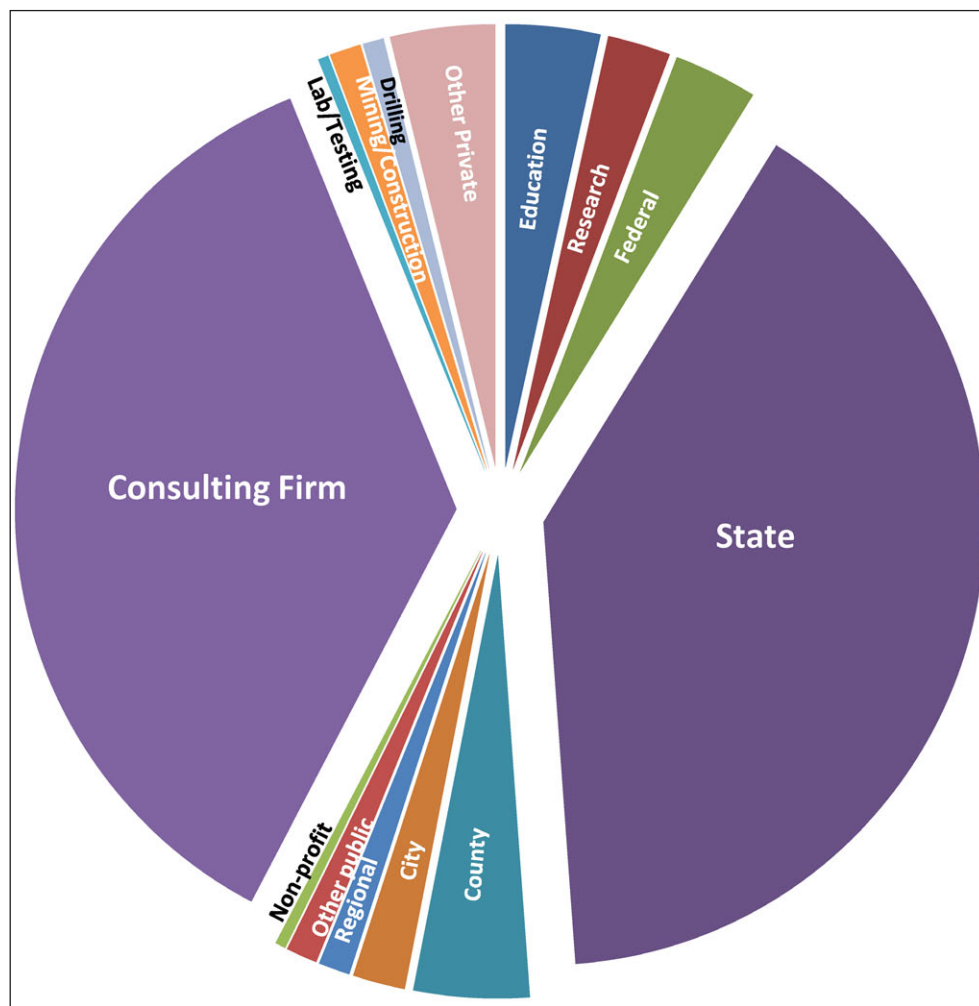


Figure 4: Employment of MGWA survey respondents

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Salary Survey Results, part 1, cont.

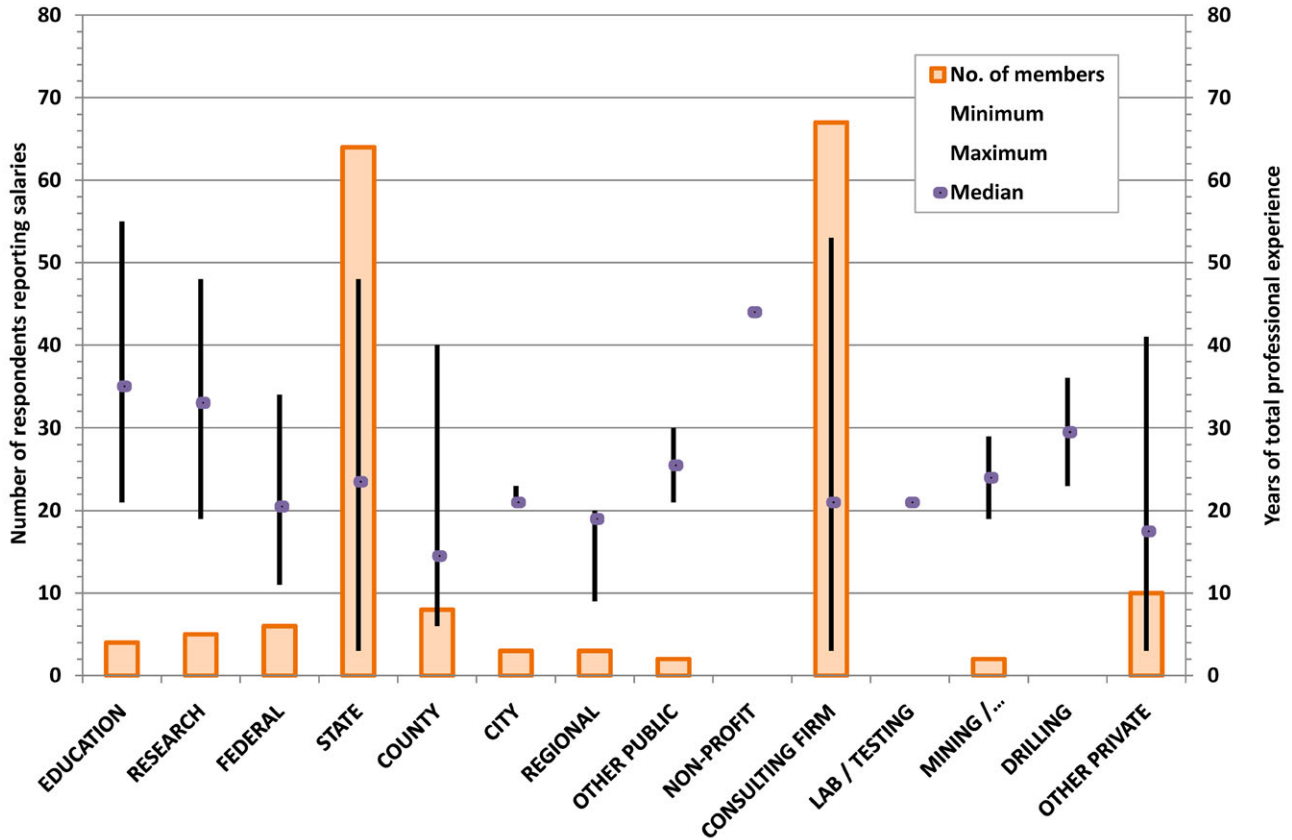


Figure 5. Members' total professional experience, by employer groups

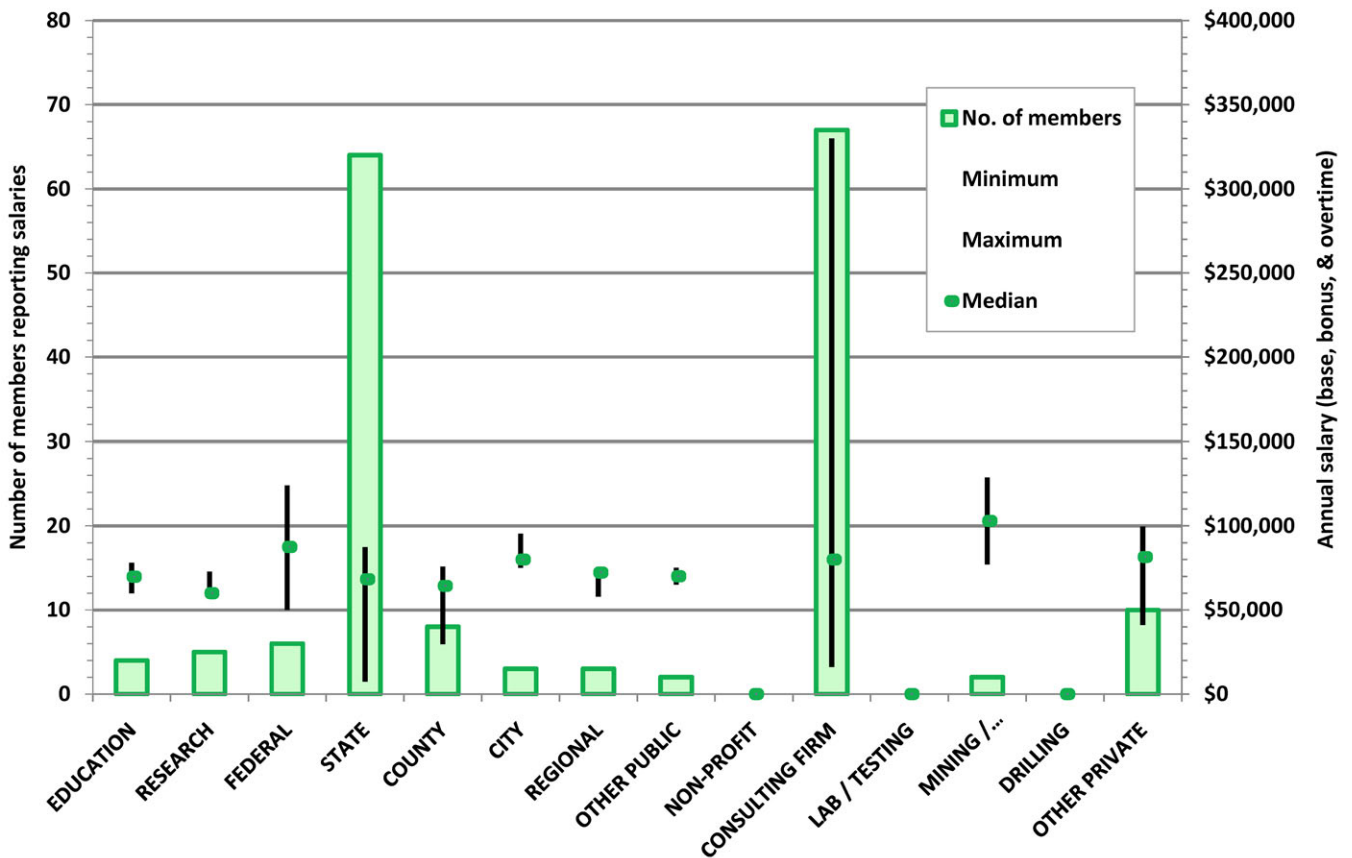


Figure 6. Members' annual salaries, by employer groups

## Salary Survey Results, part 1, cont.

The professional experience medians for the Public and Private Sectors are 23.0 and 21.0 years, respectively. Similarly, the 25-percent and 75-percent quartiles for the Public Sector are also higher, showing that in general the respondents in the Public Sector have slightly more experience. The median salaries of the Public and Private Sectors are \$69,660 and \$77,000, respectively. All quartiles of the Private Sector are higher as well as those of the Public Sector, indicating that salaries for the Private Sector are generally higher.

Comparing benefits, the medians for the Public and Private Sectors are \$9,641 and \$5,272, respectively. Similarly, the 25-percent and 75-percent quartiles for the Public Sector are also higher, showing that in general the respondents in the Public Sector have somewhat higher benefits. This is also seen in the comparison of PTO. The medians for the Public and Private Sectors are 37.0 and 23.0 days, respectively. Similarly, the 25-percent and 75-percent quartiles for the Public Sector are also higher,

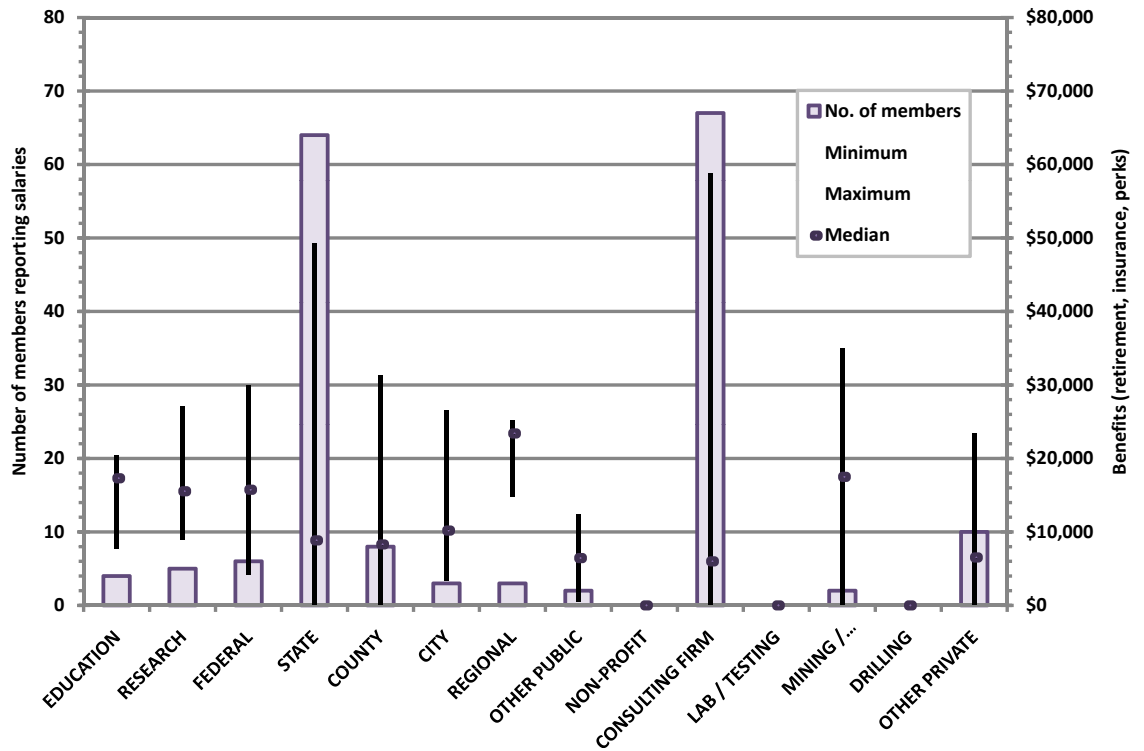


Figure 7. Members' benefits by employer groups

showing that in general the respondents in the Public Sector have more paid time off.

These results are meant to provide a context for the types of compensation for individual professionals and for groups of professionals.

We hope that this information can be useful for overcoming anecdotal comparisons of the compensations of the different types of educational levels, lengths of experience, and places of employment.

**NEXT ISSUE: Further demographics of the membership and compensation by gender and age.**

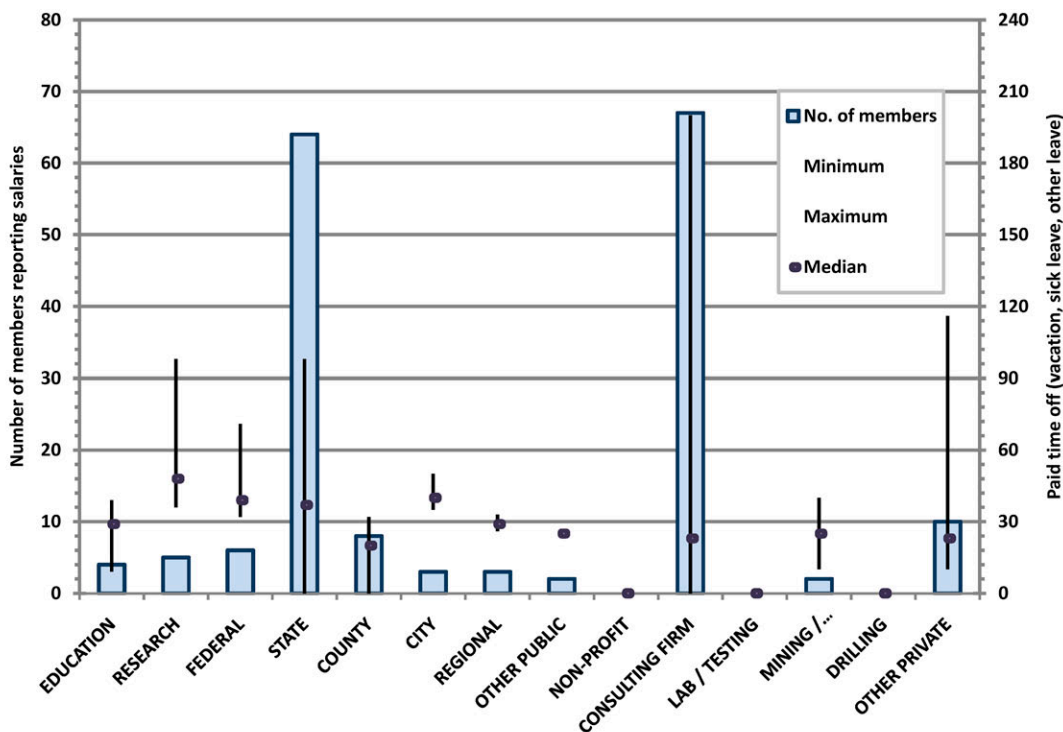


Figure 8. Members' paid time off, by employer groups



Salary Survey Results, part 1, cont.

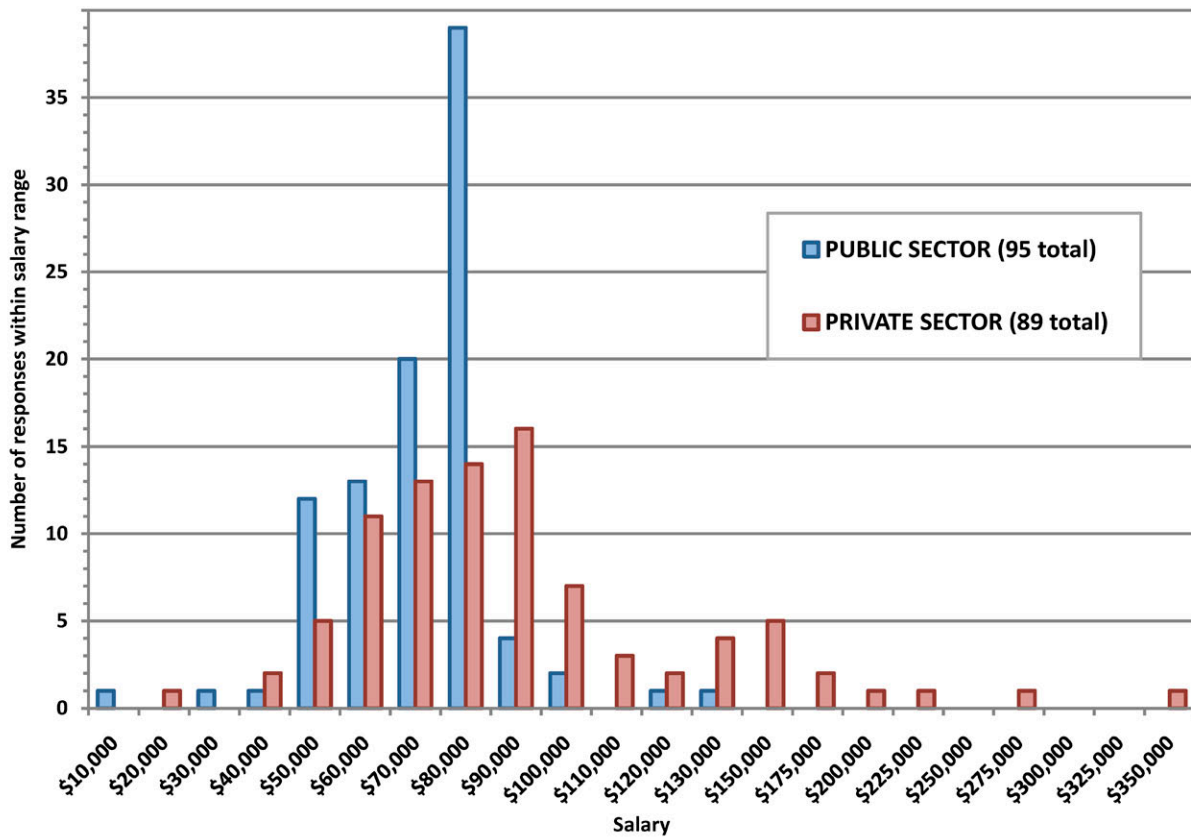


Figure 9. Annual salary (base + bonus + overtime)



# opportunities

## in changing times

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\*Environmental Business Journal and CE News

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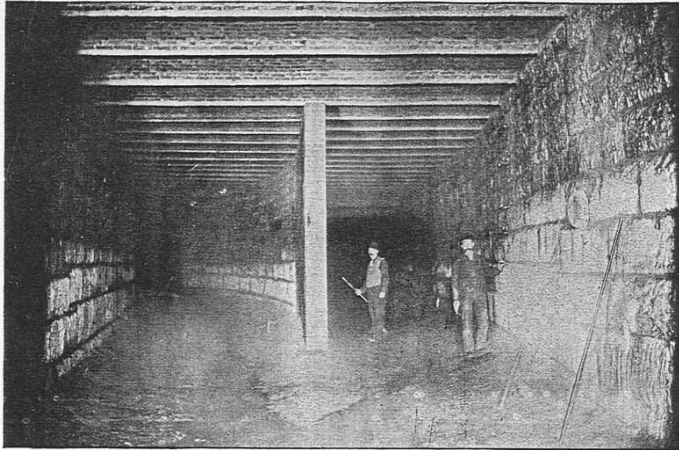
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## Subterranean Wonders of the Twin Cities

by Greg Brick

*I have compiled a list of what I regard as the most important and unique subterranean features of the Minneapolis-St. Paul Metro area, whether they be natural, artificial, or “inadvertent” features. All of them still exist, though perhaps not as they were in their glory days. Grouped by threes for convenience, the following, describing three subterranean streams, is the third of four articles in this “miniseries.”*

**Trout Brook-Phalen Creek Tunnels.** One of the most salient topographic features of downtown St. Paul is the mile-wide gap in the white crescent of sandstone cliffs along the Mississippi



JUNCTION OF TROUT BROOK AND PHALEN CREEK SEWERS.

River, occupied by what is now Lowertown, but formerly better known as the valleys of Phalen Creek, together with its largest tributary, Trout Brook. In a monumental cut-and-fill job, Baptist Hill, a mound of glacial debris 50 feet high, formerly located where Mears Park is today, was carted eastwards after the Civil War under the direction of city engineer David L. Curtice and dumped into the morass where the two streams came together. In the process, Phalen Creek and Trout Brook remained at their original, lower level—well on their way to becoming “subterranean.” Trout Brook, with various extensions, has been built into a tunnel stretching to Lake Como, about five miles away.

**Bassett Creek Tunnel.** Bassett Creek is sometimes called Minneapolis’s “other stream,” in contrast to the better-known Minnehaha Creek. Originating at Medicine Lake in Plymouth, it collects



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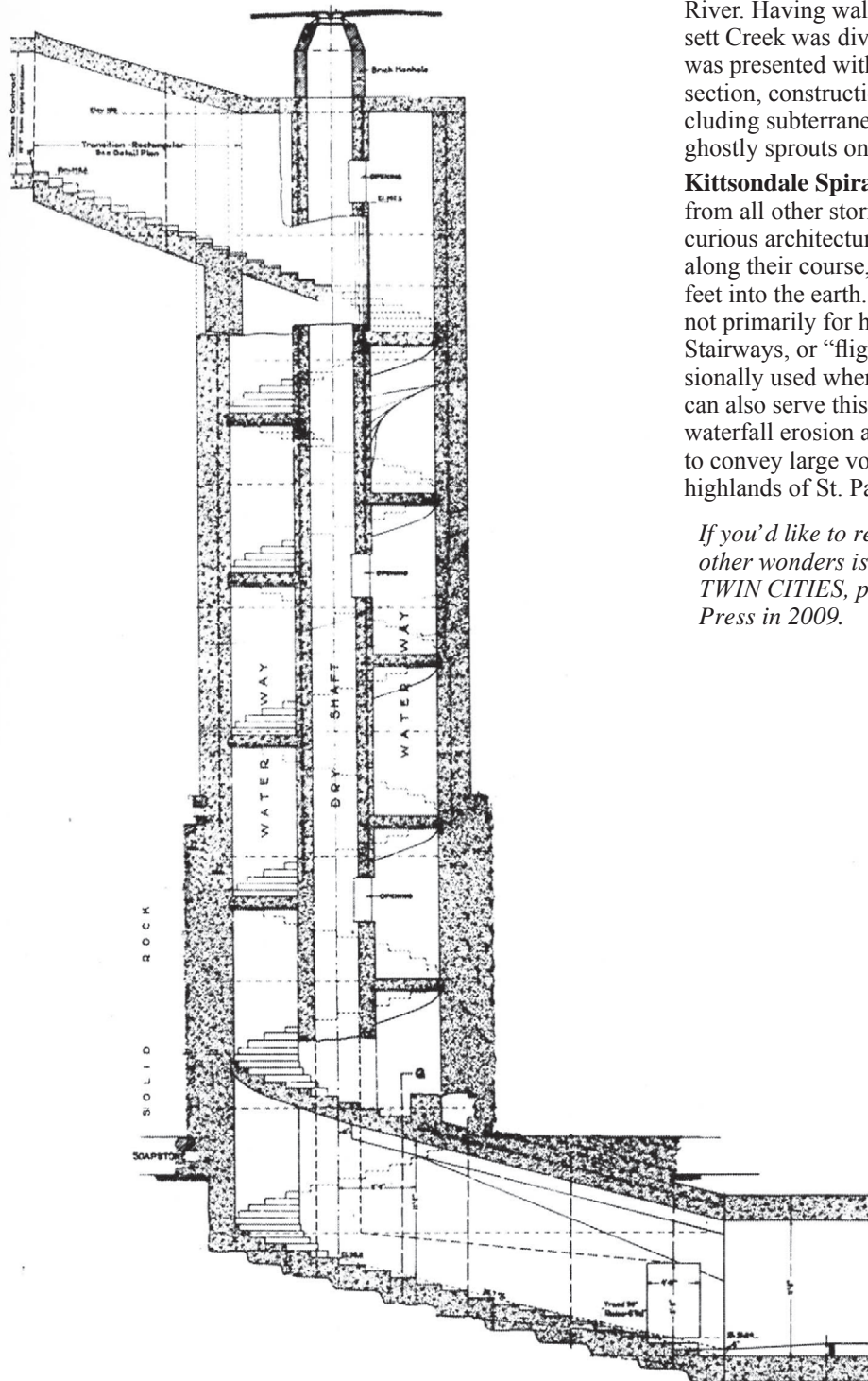
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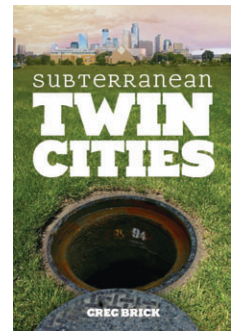
## Subterranean Wonders, cont.



water from 40 square miles before entering a tunnel (constructed 1914-1923) and flowing underground 1.5 miles to the Mississippi River. Having walked and canoed through the tunnel before Bassett Creek was diverted into a deep-level diversion in the 1990s, I was presented with a delightful succession of changes of cross-section, construction materials, and subterranean phenomena, including subterranean “gardens” where washed-in seeds produced ghostly sprouts on the sandbars.

**Kittsondale Spirals.** The Kittsondale tunnels are distinguished from all other storm-water tunnels under the Twin Cities their curious architecture. They contain vast subterranean stairways along their course, stairways that descend more than a hundred feet into the earth. And strangely enough, these stairways were not primarily for human beings. What, then, was their purpose? Stairways, or “flight sewers,” as engineers call them, are occasionally used where a sharp drop is necessary. Ordinary shafts can also serve this function but are plagued with problems of waterfall erosion at the bottom. The Kittsondale stairways served to convey large volumes of stormwater from the Decorah Shale highlands of St. Paul down to the level of the Mississippi River.

*If you'd like to read more, an extended account of these and other wonders is provided in Greg Brick's SUBTERRANEAN TWIN CITIES, published by the University of Minnesota Press in 2009.*



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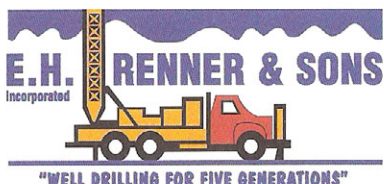
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## South-Central Minnesota Groundwater Monitoring of the Mt. Simon Aquifer

by James A. Berg and Scott R. Pearson, Division of Ecological and Water Resources, Minnesota Department of Natural Resources

### Introduction and purpose

The 2008 and 2009 legislatures allocated funding from the Environment and Natural Resources Trust Fund for an aquifer investigation, mapping, and monitoring project in south-central and east-central Minnesota (Figure 1). The 2008/2009 allocations provide \$4,295,000 for a 4-year project. The allocation is being shared by the DNR (\$2,769,000) and the MGS (\$1,526,000) to evaluate the Mt. Simon aquifer and produce geologic atlases. This article is a summary of a report submitted to the Legislative Citizen Commission on Minnesota Resources (LCCMR) for the first phase of the DNR portion of this project as required by the statute (ML 2008, Chap. 367, Sec. 2, Subd. 4 (h)). A report summarizing the second phase of the project west and northwest of the Twin Cities metropolitan area is scheduled for completion June 30, 2012.

The deepest bedrock aquifer of south central/southeastern Minnesota, including the Minneapolis/St. Paul metro area, is the thick (50 to >200 feet) Cambrian sandstone Mt. Simon aquifer (Mossler, 2008). It supplies all or some of the water used by over one million Minnesotans. The few water level measurements available from this aquifer in the Mankato and Minneapolis/St. Paul metropolitan areas indicate declining water levels in some parts of these areas where water is being withdrawn for municipal and commercial use. While efforts currently are underway through

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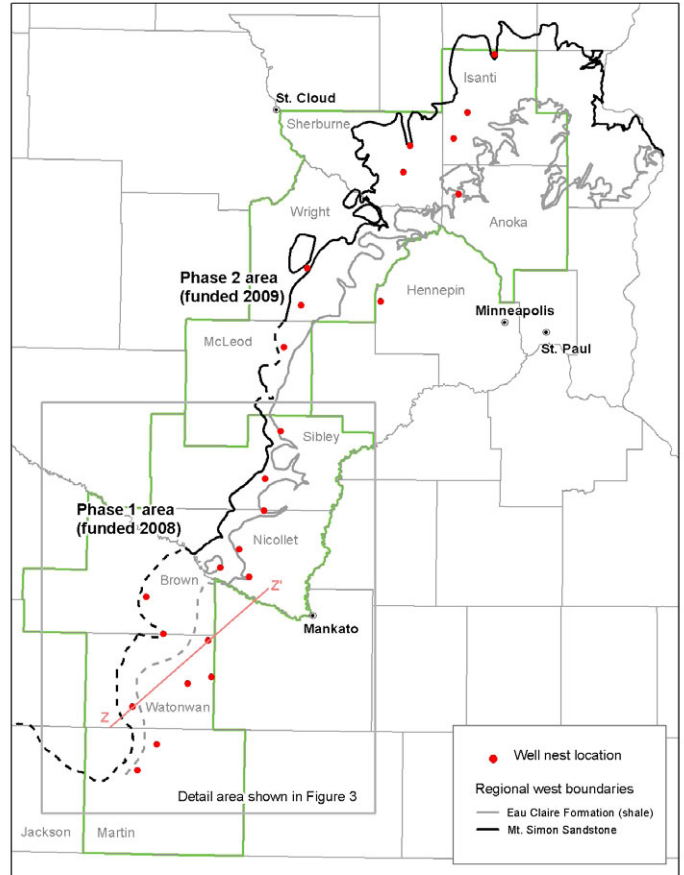


Figure 1. Project locations and trace of cross section

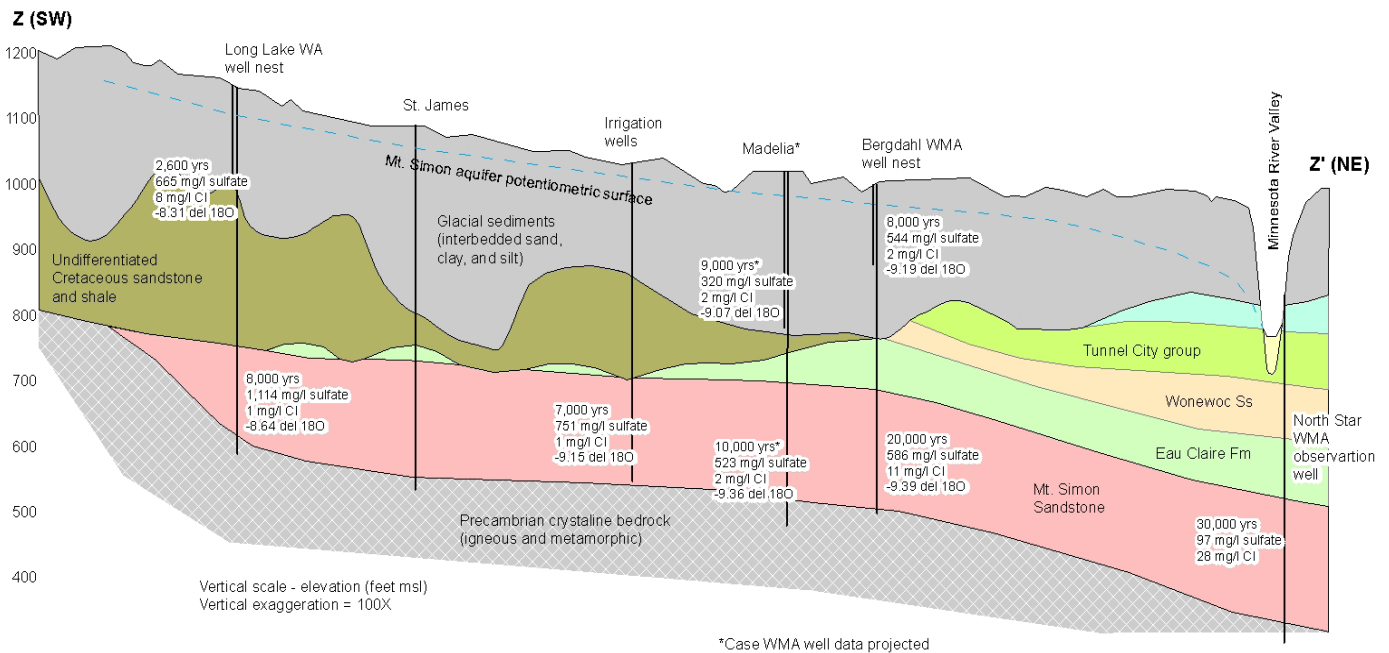


Figure 2. Cross section Z - Z' across the western edge of the Mt. Simon Aquifer in south-central Minnesota

## Mt. Simon Aquifer Monitoring, cont.

other agency and additional Minnesota Department of Natural Resources projects to locally map and understand these depressed Mt. Simon water level areas, we believed a project to regionally understand the recharge dynamics of the Mt. Simon aquifer was needed. The western and northern edge of the Mt. Simon aquifer (Figures 1 and 2), where it is not overlain by relatively impermeable Paleozoic shale formations, was considered the most likely area for aquifer recharge. This edge of the Mt. Simon aquifer was investigated and characterized through observation well installations, water level monitoring, groundwater chemical analysis, and aquifer capacity testing to help determine recharge pathways and sustainable limits for this aquifer.

Most data collected for this study are derived from the wells installed at 14 locations by contracted drilling companies. Staff from the DNR Ecological and Water Resources Division coordinated the installation of these wells. Drilling in the northern portion of the investigation area (Phase 2) began in the fall of 2009 to complete well nests (two or more observation wells completed at the same location but at different depths) at an additional 10 locations. The wells were completed in the Mt. Simon aquifer and shallower aquifers on public property in the project area to depths of 70 feet to 718 feet. A shallow and deep well were drilled at most locations to provide data on the vertical changes of hydraulic head, gradients, groundwater chemistry, and residence time.

## Geochemistry

### Residence time indicators

Of the two residence time indicators used in this project: tritium and carbon-14 ( $^{14}\text{C}$ ), the  $^{14}\text{C}$  data were the most revealing for the purposes of this project due to the relatively isolated nature of the Mt. Simon aquifer in this region. Residence time is the approximate time that has elapsed from when the water infiltrated the land surface to when it was pumped from the aquifer for these investigations. In general, short residence time suggests high recharge rates, whereas long residence time suggests low recharge rates. The  $^{14}\text{C}$  isotope is used to estimate groundwater residence in a time span from about 100 years to 40,000 years before present (Alexander and Alexander, 1989).

Figure 3 shows the distribution of  $^{14}\text{C}$  residence time values from the Mt. Simon wells constructed for this project, two additional Mt. Simon wells sampled for this project, and Mt. Simon data from other studies (Lively and others, 1992; Alexander, personal communication). Values in the southern portion of the study area range from 7,000 – 8,000 years in central Watonwan County to 30,000 years near the Minnesota River following a pattern of increasing age away from central Watonwan County. The youngest values (8,000-10,000 years) in the northern portion of the study area occur in northeastern Sibley County and also increase in age toward the Minnesota River to the south and east.

The younger  $^{14}\text{C}$  residence time values (7,000-8,000 years) roughly correspond to a time not only after the last ice sheet had receded from southern Minnesota, but also after the time when the modern day Minnesota River Valley (Glacial River Warren) ceased to be the main discharge route for the glacial melt water (9,500 years) that was stored in Glacial Lake Agassiz (Wright, 1987). These  $^{14}\text{C}$  values and the unique glacial history of the region suggest groundwater in the Mt. Simon aquifer in this region began as precipitation that infiltrated during the post-glacial

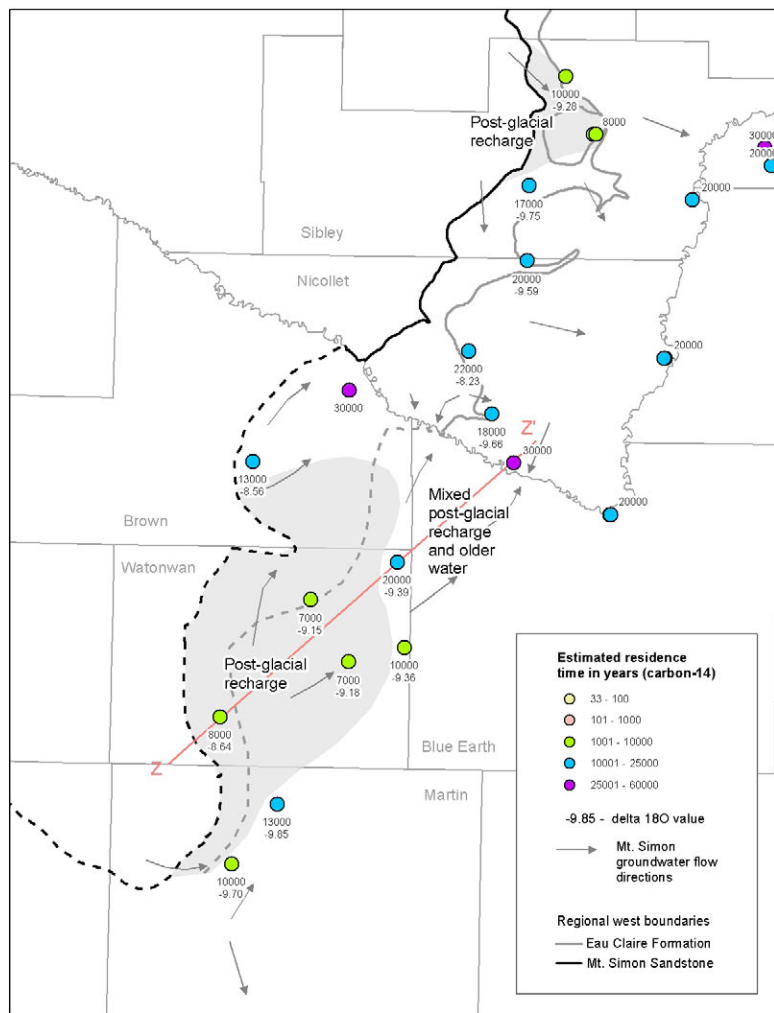


Figure 3. Estimated residence time and recharge interpretation

period. The stable isotope data provided corroborating evidence for this conclusion.

### Stable isotopes

All groundwater samples collected from the study area were analyzed for stable isotopes of oxygen and hydrogen, the two elements found in water. Isotopes of a particular element have the same number of protons but different numbers of neutrons. Stable isotopes are not involved in any natural radioactive decay. They are used to understand water sources or the processes affecting them (Kendall, 2003). Commonly used isotopes for these purposes include oxygen isotopes  $^{16}\text{O}$  and  $^{18}\text{O}$  and hydrogen isotopes  $^1\text{H}$  and  $^2\text{H}$ . The heavy hydrogen ( $^2\text{H}$ ) is called deuterium. The mass differences between  $^{16}\text{O}$  and  $^{18}\text{O}$  or  $^1\text{H}$  and  $^2\text{H}$  result in water molecules that evaporate or condense at different rates. Thus the concentrations of these isotopes in water changes (fractionates) during evaporation and precipitation, resulting in different  $^{16}\text{O}/^{18}\text{O}$  and  $^1\text{H}/^2\text{H}$  ratios in rain, snow, rivers, and lakes. The values are expressed as  $\text{del}^2\text{H}$  and  $\text{del}^{18}\text{O}$ . The abbreviation "del" denotes the relative difference from standard mean ocean water and expresses the relative abundance of the rarer, heavy isotopes,  $\text{del}^2\text{H}$  and  $\text{del}^{18}\text{O}$ . Samples more depleted in heavy isotopes suggest water that precipitated from a colder atmosphere (Siegel, 1989). Person et al (2007) provided a compilation of paleohydrological studies of groundwater systems in North America that were affected by the advance and retreat of the Laurentide ice sheet. He concluded

— continued on page 15

## Mt. Simon Aquifer Monitoring, cont.

that the range of  $\delta^{18}\text{O}$  groundwater values from cold ice or snow melt sources ranges from  $\delta -25$  to  $-9$ . Most values of groundwater samples from south central Minnesota ranged from approximately  $\delta -8$  to  $\delta -10$  suggesting a mixture of glacial meltwater and a larger component of post-glacial precipitation. The data are consistent with the younger  $^{14}\text{C}$  ages dates (7,000 to 8,000 years) from the post-glacial and post River Warren era as discussed previously.

It is also significant to note that many of the older  $^{14}\text{C}$  values in this area are in the range of the last glacial advance in the upper Midwest (12,000 to 24,000 years BP) but the  $\delta^{18}\text{O}$  values are just slightly within the range of water from ice melt sources ( $\delta -25$  to  $\delta -9$ ). This apparent discrepancy suggests that these waters are from mixed sources and time periods, indicating a combination of much younger and much older water. Recognizing that all groundwater is a mixture, the Mt. Simon  $^{14}\text{C}$  residence time values greater than 9,000 or 10,000 years may represent a minimum age in these areas.

### Sulfate and chloride

Figure 2 shows a typical distribution of sulfate and chloride along cross section Z-Z'. Higher sulfate concentrations in the Mt. Simon aquifer tend to occur in the southern and western portions of the study area where infiltrating water has passed through Cretaceous sandstone and shale layers that contain sulfate minerals such as gypsum and anhydrite. Evidence of deep isolated groundwater or upwelling from deep, crystalline bedrock sources is suggested by some elevated chloride values of samples collected near the Minnesota River Valley such as the North Star WMA observation well shown in Figure 2 and other locations near the valley.

### Paleohydrology and recharge estimates

Data and interpretations generated by this project provide some basis for a rough estimate of groundwater recharge through over-

lying glacial sediments and Cretaceous formations to the Mt. Simon aquifer subcrop in south central Minnesota. The 7,000-8,000 year residence time of Mt. Simon groundwater in the region (Figure 3 - Watonwan County and adjoining areas and northern Sibley County near the City of Arlington) and the development of post-glacial drainage conditions in the Minnesota River Valley at approximately 9,000 years BP (before present) suggest the current flow conditions toward the valley and slow recharge of the aquifer began at approximately that time. Prior to that time the much larger volume of water flowing through the valley as glacial River Warren would have created higher head conditions in that area and a lower gradient that might have inhibited flow toward the valley in the Mt. Simon and overlying aquifers. Siegel (1989) suggests that flow in the Mt. Simon aquifer during the glacial maximum (16,000-14,000 years BP) was easterly toward the ancestral Mississippi River.

A conceptual model of recharge to the Mt. Simon subcrop (Figure 4) is based on geochemical data shown on the generalized cross section Z-Z' (Figure 2) and other data in the region. This cross section is drawn parallel to Mt. Simon groundwater flow and is meant to represent a flow path from the recharge areas southwest of the Minnesota River to the discharge area (Minnesota River). The  $^{14}\text{C}$  residence times are younger in areas to the southwest in the Mt. Simon aquifer and overlying aquifers. Higher sulfate concentrations in the Mt. Simon aquifer in the southwest indicate downward groundwater flow through the overlying Cretaceous formations. Slightly higher chloride concentrations have been detected in wells closer to the discharge area suggesting some upward migration of older water from Precambrian crystalline bedrock. Finally, the least negative (warmer)  $\delta^{18}\text{O}$  values are found in Mt. Simon wells on the left portion (upgradient) of the cross section and in the shallower wells, whereas the more negative  $\delta^{18}\text{O}$  values (colder) were found in wells on the right (downgradient) portion of the cross section.

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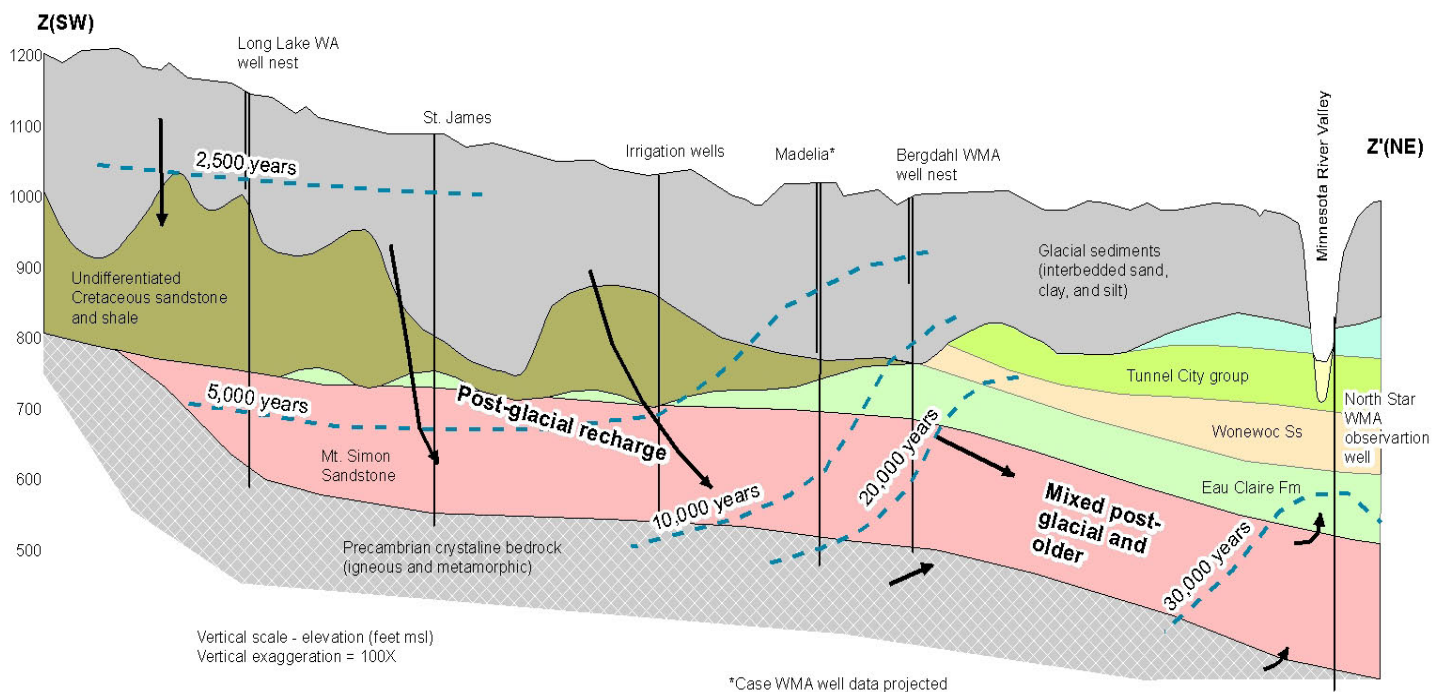


Figure 4. Interpretation of groundwater recharge along cross section Z - Z' across the western edge of the Mt. Simon Aquifer in south-central Minnesota

## Mt. Simon Aquifer Monitoring, cont.

A rough estimate of Mt. Simon aquifer recharge rates and amounts can be made from the data and relationships shown in Figures 3 and 4. The groundwater residence time values from most of the Mt. Simon wells are assumed to be an average value of age-stratified water in the well. Actual values from discrete intervals within the wells might vary from top to bottom. Therefore, an assumed 5,000 year value contour was placed near the top of the Mt. Simon aquifer for the wells in the "post-glacial recharge" area. The depth to the top of this contour in this area ranges from approximately 350 to 450 feet. Assuming an average penetration depth of 400 feet, groundwater traveling to the top of the Mt. Simon aquifer moved at approximately 0.08 feet/year or approximately 2 cm/year. The area labeled "post-glacial recharge" (Figure 3) is approximately 1,000 square km (386 square miles). The volume of recharge across this area would be approximately 20 million cubic meters or about 5 billion gallons/year. Permitted volumes (volume of water that the users are allowed to pump) for appropriators in this area are approximately 4.7 billion gallons/year, or roughly equal to the estimated Mt. Simon post-glacial recharge in the southern area.

## Conclusions

Data from this project has improved the general understanding of the aquifer boundaries, thickness, permeability, and extent of overlying confining units. In addition, basic data have been generated regarding groundwater residence time and water levels in the Mt. Simon aquifer.

Estimates of groundwater recharge rates suggest the sum of the permitted Mt. Simon aquifer volumes may be equal to those replacement rates. The Mt. Simon edge region is currently not an area of rapid municipal or industrial growth. Locally intensive groundwater pumping can create groundwater interference issues (lowered water levels in nearby wells or surface water features) but at current extraction the region appears to be in a steady state. The effect of future increases in groundwater appropriation from the Mt. Simon due to population growth, industrial development, or drought might push this resource beyond this steady state. However, a major accomplishment of this project is the creation

of a network of observation well nests along the western margin of this aquifer system. Long term water level data and geochemistry from these wells will enable future hydrologists to evaluate the local and regional effects of any future expansion of Mt. Simon groundwater pumping in the region beyond current volumes.

The PDF file for this report is available online at:

[files.dnr.state.mn.us/publications/waters/south\\_central\\_mn\\_gw\\_monitoring.pdf](http://files.dnr.state.mn.us/publications/waters/south_central_mn_gw_monitoring.pdf)

We can also be contacted by telephone: Jim Berg (651) 259-5680, Scott Pearson (651) 259-5720.

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The MGWA membership needs to fill two officer positions – President-Elect and Secretary – for the year 2012. The **President-Elect** takes a leadership role in the planning of one or more of the MGWA meetings while "learning the ropes" of MGWA leadership. The **Secretary** keeps the minutes of all MGWA board meetings and is the custodian of the Association's official paperwork. The Secretary also assists with the conference planning. These are great opportunities for someone to get in on the front end of ground water resource protection in Minnesota as well as give back to their profession.

The Secretary serves a two-year term, and the President-Elect serves one year before becoming President in 2013, followed by a year as Past President. The Past President also serves on the MGWA Foundation Board. Send nominations by November 1<sup>st</sup> to MGWA, c/o WRI Association Mgmt Co., 4779 126<sup>th</sup> North, White Bear Lake, MN 55110, or via e-mail to [office@MGWA.org](mailto:office@MGWA.org).



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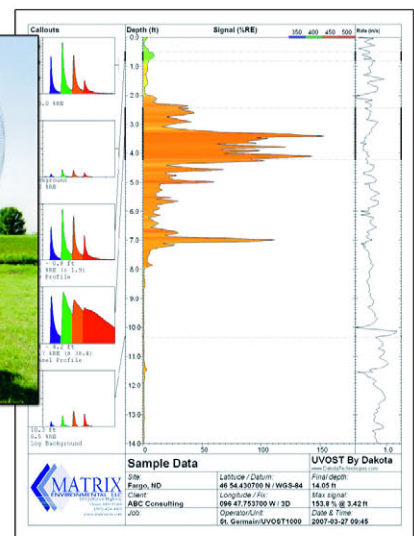
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### Minnesota Groundwater Level Monitoring Network

#### Guidance Document for Network Development

This report to the Legislative-Citizen Commission on Minnesota Resources (LCCMR) is part of the project titled “South-Central Groundwater Monitoring and County Geologic Atlases” prepared by Scott Pearson, Jan Falteisek, and Jim Berg and funded by the Environmental Trust Fund.

Minnesota’s environmental and economic future depends on a continued and available supply of groundwater that is managed sustainably. The Minnesota Department of Natural Resources is responsible for managing the quantity of groundwater use through appropriation permits and monitoring water levels. Groundwater quantity estimates depend on a historical record of water level measurements from water wells. The state’s current groundwater level monitoring network cannot provide adequate statewide groundwater quantity information because many areas and groundwater resources are unmonitored.

The Guidance Document outlines how to expand Minnesota’s current groundwater level monitoring (GWLM) network of approximately 750 wells, as shown in Figure 1, to approximately 7000 groundwater level monitoring wells. Many areas of Minnesota are underlain by multiple aquifers, all of which must be considered in developing the long-term network that will provide adequate resource data. To distribute wells across the State, a system based on well density and allocation was developed. One of the initial steps is to determine the more suitable unit area in which to distribute wells. The Guidance Document details how unit areas can be designated for large and small scale areas that are linked to depth and several hydrologic aspects.

Once unit areas and distribution values have been assigned, the allocation of GWLM wells is advanced by applying a simple percentage based method to the groundwater resources located within that unit area to determine the goal number of wells per resource. This forms the basic format that is further expanded using additional information and including existing GWLM wells and iterative phases of construction.

The Guidance Document provides the DNR with a guide to build the backbone network that will support the state’s current and future groundwater level monitoring information needs. Network wells will become long-term assets used to fully understand, manage, and assess Minnesota’s groundwater resources. As described in the document, this is an unprecedented expansion project that will vastly improve the understanding of Minnesota’s groundwater resources. The envisioned expansion is a very significant undertaking, estimated to require approximately 30 years to complete and is estimated to cost \$94.7 million. The continued operation and maintenance of the network assets as the network expands is also a significant undertaking, requiring on-going support to acquire, analyze, and interpret groundwater level data and to make the data readily available to a wide variety of users.

The Minnesota groundwater level monitoring network, as it develops into the future, is intended to meet information needs for sustainable management of water resources. The existing network, while limited, provides invaluable data for resource managers; the expanded network will provide greatly improved data resource to understand groundwater system response to change and provide the groundwater quantity data needed to make informed decisions to protect Minnesota’s groundwater resource for the future.

The report can be found at: [http://files.dnr.state.mn.us/publications/waters/groundwater\\_network\\_guidance.pdf](http://files.dnr.state.mn.us/publications/waters/groundwater_network_guidance.pdf)

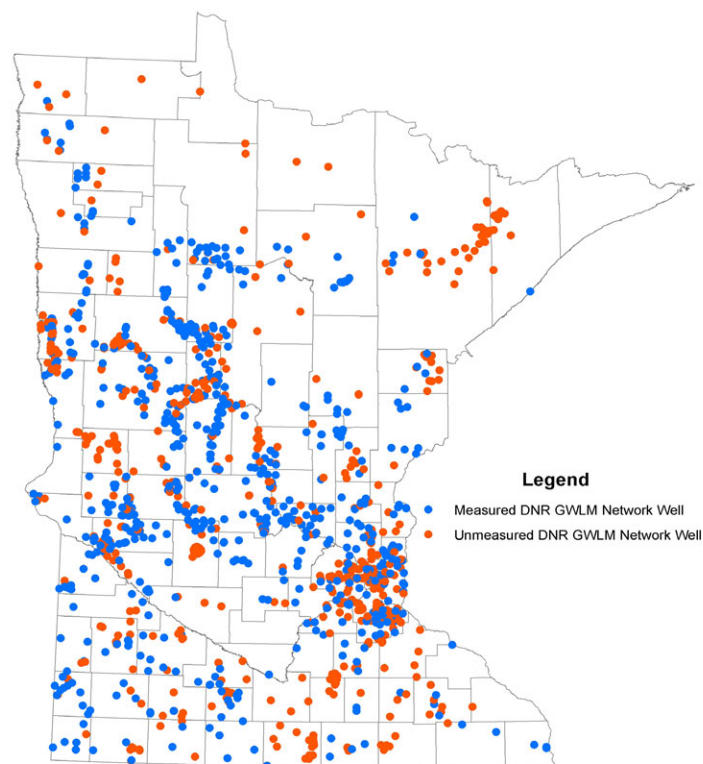


Figure 1. Map of measured and unmeasured DNR GWLM wells.

### MDA 2010 Water-Quality Monitoring Results

Ground and surface water quality results from 2010 have been published by the MDA. The report presents water-quality results for 2010 as well as summaries of historical pesticide data. The report also presents monitoring results for selected nutrients and sediments. The information presented in this report is used to characterize and assess the natural and general extent of pesticide impacts to Minnesota’s water resources.

The full report is located at: [www.mda.state.mn.us/~media/Files/chemicals/maace/2010wqmreport.aslx](http://www.mda.state.mn.us/~media/Files/chemicals/maace/2010wqmreport.aslx)

### Perched Groundwater in Wisconsin

The journal *Ground Water* (volume 49, no. 3, pp. 383-392) published the following article of regional interest in its May-June 2011 issue: *Field verification of stable perched groundwater in layered bedrock uplands*, by Jonathon T.V. Carter, Madeline B. Gotkowitz, and Mary P. Anderson.

The article presents data substantiating perched conditions in layered bedrock uplands in the Driftless Area of southwestern Wisconsin. Using data from a densely instrumented field site, the researchers confirmed that stable perched groundwater extends across the layered bedrock upland. Refer to <http://onlinelibrary.wiley.com/doi/10.1111/gwat.2011.49.issue-3/issuetoc>.

## MPCA's Role in Groundwater Protection

by Byron Adams, MPCA

The Groundwater Protection Act of 1989 (GWPA) requires the Minnesota Pollution Control Agency (MPCA) to develop, promote, and monitor the effectiveness of best management practices (BMPs) that prevent, minimize, reduce, and eliminate sources of groundwater degradation. These requirements apply to MPCA programs with activities that may cause or contribute to groundwater pollution for non-agricultural pollutants.

To address the requirements of the GWPA, the MPCA has set goals in the agency's strategic plan to identify and evaluate groundwater BMP effectiveness. The goals direct the MPCA to:

- 1) identify groundwater BMPs;
- 2) highlight BMPs where more data is needed to evaluate their effectiveness; and
- 3) develop a plan to address data needs that will enhance the program's groundwater BMPs.

A review of MPCA programs was conducted to identify groundwater BMPs and highlight areas where additional data is needed to evaluate the effectiveness of BMPs in preventing groundwater contamination. The review focused on MPCA programs that typically conduct less groundwater monitoring or have limited information of their program's impacts to groundwater quality and include the following programs:

- ◆ Subsurface Sewage Treatment Systems (SSTS)
- ◆ Animal Feedlots
- ◆ Biosolids
- ◆ Land and Water Quality Permits for land applied industrial wastewater and by-products
- ◆ Stormwater
- ◆ Solid Waste Demolition Landfills
- ◆ Municipal Inflow and Infiltration (I&I)

Program reviews found that MPCA programs incorporated numerous BMPs to prevent groundwater contamination into program rules, permits, policies, and guidelines. Examples of BMPs that apply to sensitive groundwater settings include: set back distances for land applied manure, biosolids and industrial by-products, locational restrictions for manure storage and demolition landfills, design guidelines for stormwater infiltration (as found in the Minnesota Stormwater Manual at [www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/](http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/))

[stormwater-management/minnesota-s-stormwater-manual.html](http://stormwater-management/minnesota-s-stormwater-manual.html)), limits on nitrogen application rates for highly permeable soils, and more rigorous design guidelines for SSTS based on aquifer sensitivity.

### Groundwater Data Needs

Several programs highlighted areas where additional groundwater data was needed to evaluate BMP effectiveness, including: mid-sized to large-sized SSTS sites, select animal feedlot manure storage basins, stormwater infiltration sites in sensitive groundwater settings, and specific industrial wastewater sprayfield land application sites.

In general, programs that manage land-applied solid wastes do not require the collection of groundwater quality data because BMPs have been designed to specifically prevent groundwater contamination (biosolids, land-applied manure from feedlots, and industrial by-products). Research suggests that when these BMPs are properly applied, impacts to groundwater quality are minimal.

In addition, both the Solid Waste Demolition Landfill and Animal Feedlots programs identified a need to conduct a more rigorous statistical evaluation of their groundwater databases to evaluate overall program BMP effectiveness in protecting groundwater resources.

An abbreviated list of the program data needs is included in the table below. More detailed descriptions are provided in the MPCA report "Best Management Practices and Data Needs for Groundwater Protection", March, 2011. Copies of the report can be obtained by contacting Byron Adams at the MPCA at: 651/757-2180.

## Contaminants of Emerging Concern

Fifteen researchers in the area of contaminants of emerging concern (CECs), including Dr. Paige Novak at the University of Minnesota, urge a coordinated global program of research into the sources and fates of CECs and the exposure risks associated with them. They argue this would replace the present scattershot approach and would provide solutions and reliable information for policy-makers. CECs are natural or synthetic chemicals that can affect an organism's ability to communicate with and respond to its environment. See "Unite to Assess Contaminant Risk", in the journal Nature, page 578, vol. 471, 31 March 2011, [www.nature.com/nature/journal/v471/n7340/full/471578a.html](http://www.nature.com/nature/journal/v471/n7340/full/471578a.html)

MPCA Programs	Program Data Needs & Recommendations
Demolition Landfills	<ol style="list-style-type: none"> <li>1. Groundwater data analysis of existing data set.</li> <li>2. Groundwater monitoring system analysis.</li> <li>3. Leachate testing of demolition waste.</li> </ol>
SSTS Program	<ol style="list-style-type: none"> <li>1. Groundwater monitoring at midsize subsurface treatment system (MSTS) sites.</li> <li>2. Assess impacts of smaller individual sewage treatment systems (ISTSS) to groundwater.</li> <li>3. Monitoring for contaminants of emerging concerns.</li> </ol>
Animal Feedlot Program	<ol style="list-style-type: none"> <li>1. Water quality testing of drain tile discharge at manure storage basins.</li> <li>2. Data analysis of groundwater &amp; tile discharge at permitted facilities.</li> <li>3. Evaluate older manure storage basins in SE Minnesota.</li> </ol>
Industrial Wastewater & Industrial By-product Land Application	<ol style="list-style-type: none"> <li>1. Groundwater evaluation of high biochemical oxygen demand irrigation sites (As, Fe &amp; Mn).</li> <li>2. Unusual wastes and their environmental fate for land application scenarios.</li> <li>3. Program data review – Delta database.</li> </ol>
Stormwater Program	<ol style="list-style-type: none"> <li>1. Promote creation of statewide GIS layers to evaluate stormwater infiltration.</li> <li>2. Develop case studies to assess groundwater impacts for stormwater infiltration BMPs.</li> </ol>
Biosolids Program	<ol style="list-style-type: none"> <li>1. Data collection for stormwater infiltration projects.</li> </ol>
Biosolids Program	<ol style="list-style-type: none"> <li>1. No specific recommendations for groundwater monitoring.</li> </ol>
Inflow & Infiltration	<ol style="list-style-type: none"> <li>1. Limited groundwater impact concerns.</li> </ol>



## MGWA BOARD MINUTES

### Minnesota Ground Water Association Board Meeting Minutes

#### Meeting Date: June 6, 2011

Location: Fresh Grounds Restaurant, 1362 West 7th Street, St. Paul, MN  
Attendance: Mindy Erickson, President; Steve Robertson, Past President; Audrey Van Cleve, Treasurer; Jill Trescott, Secretary; Kelton Barr, President-elect; Jeanette Leete, WRI; Sean Hunt, WRI  
Past Minutes: April minutes approved as revised and May minutes approved as submitted.  
Treasury: Treasurer's report deferred until next month..  
Newsletter: The newsletter is undergoing final editing.  
Web Page: GSA Updates have been added to website.  
WRI Report: We are on track to host Midwest Groundwater Conference. The taxes are complete.  
Foundation: Foundation tax return has been filed.  
Old Business: Salary Survey: A reminder e-mail will be sent to those who have not yet filled out the salary survey.  
GSA 2011: Registration is open.  
The Otto Strack luncheon will be on Oct. 11, Tuesday. (After meeting, changed to Oct. 10.)  
Board members will review the field trip opportunities and see which one we'd like to sponsor. Kelton will find out if we could reprint the guide book for the field trip we sponsor.  
Midwest Groundwater Conference (presented by MGWA). Monday and Tuesday, September 24-25, 2012, plus field trip day. Exploring possible venues regarding facilities and costs.  
2013 Conference dates. -- Spring Conference will be Wednesday, April 24, and Fall Conference will be Wednesday, November 13..

#### Meeting Date: July 8, 2011

Location: Fresh Grounds Restaurant, 1362 West 7th Street, St. Paul, MN  
Attendance: Mindy Erickson, President; Steve Robertson, Past President; Jill Trescott, Secretary; Kelton Barr, President-elect; Jeanette Leete, WRI; Sean Hunt, WRI; Tedd Ronning, Newsletter  
Past Minutes: June minutes approved as corrected.  
Treasury: Cash on hand is approximately \$50,000. Based on the 2010 finances, about \$7,000 could be available for the Foundation. Action was postponed until Steve can discuss it further with the Foundation's board..  
Newsletter: Production of the September newsletter is in process.  
Web Page: Sean has uploaded the sound files from the Spring Conference to the website and updated the calendar.  
WRI Report: Sean has registered the domain name for the Midwest Groundwater Conference. The Minnesota taxes have been filed. Leggette, Brashears renewed their membership.  
Foundation: No report  
Old Business: Salary Survey: Kelton and Sean provided the rest of the board with the preliminary results of the salary survey. It will be published in an upcoming issue of the newsletter.  
GSA 2011: The Otto Strack luncheon will be on Oct. 10, Monday. It will cost attendees \$40.00, which will not full cover the cost to MGWA..A second e-mail will be sent to the membership, reminding them to register  
Midwest Groundwater Conference (presented by MGWA). The Earl Brown Heritage Center in Brooklyn Park was selected for the venue. The date was changed to October 1-3, 2012.  
New Business: Member numbers: WRI has created membership numbers and sent an e-mail to the membership, letting them know how to find their number.  
Policy for advertising courses: WRI adds them to the calendar if they are relevant and local. They will send an e-mail to the membership for free for a non-profit organization and for \$50 for a for-profit organization. Anyone can publish a display ad in the newsletter at the published rates.

#### Meeting Date: August 5, 2011

Location: Fresh Grounds Restaurant, 1362 West 7th Street, St. Paul, MN  
Attendance: Mindy Erickson, President; Steve Robertson, Past President; Jill Trescott, Secretary; Kelton Barr, President-elect; Jeanette Leete, WRI; Sean Hunt, WRI; Audrey Van Cleve, Treasurer  
Past Minutes: July minutes approved as amended.  
Treasury: Cash on hand is approximately \$53,000.

— continued on next page

### MGWA 2011 Membership Dues

Professional Rate:	\$35
Full-time Student Rate:	\$15
Newsletter (printed and mailed)	\$20
Directory	\$7

Membership dues rates were revised at the October 1, 2010 meeting of the MGWA Board. The Board intends to balance the membership services budget.


## MGWA BOARD MINUTES

### MGWA Minutes, cont.

- Newsletter: Tedd Ronning participated in the newsletter discussion on speaker phone. Copies of the newsletter will be handed out at the GSA conference. Kelton will send out a draft of the salary survey article next week.
- Web Page: The web page has information about GSA registration and the Strack luncheon.
- WRI Report: WRI Report: Getting ready for the GSA conference.
- Foundation: The Board met last Wednesday. The Foundation's Treasurer needs a copy of Quickbooks. Mindy moved to approve expenditure up to \$250. Kelton seconded. All in favor. MGWA policy is to transfer any excess revenue from the previous year to the Foundation's endowment. Based on this policy, Mindy moved to transfer \$7,000 to the Foundation, restricted to endowment. Steve seconded. All in favor.
- Old Business: Salary Survey: The salary survey was discussed. It will be published in the next two issues of the newsletter.  
GSA 2011: MGWA's field trip sponsorship will be recognized in the field trip publication. Details to be determined. An award plaque needs to be ordered. Booth volunteers are needed.  
Midwest Groundwater Conference (presented by MGWA, October 1-3, 2012). Cost will be less than \$200 per person. There is an Embassy Suites connected to the Earl Brown Heritage Center. Audrey moved to send Kelton to the 2011 conference; Mindy seconded. All in favor. Mindy moved to commit to Earl Brown Heritage Center/Embassy Suites facility and hotel. Steve seconded. All in favor.
- New Business: Request from AIPG to help cover speaker travel expenses. Audrey moved that MGWA contribute half the cost, up to \$600. Steve seconded. All in favor. non-profit organization and for \$50 for a for-profit organization.

**The MGWA Board of Directors meets once a month.**

**All members are welcome to attend and observe.**



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### Bemidji Headwaters Science Center Receives Groundwater Models

*Michele Walker, Minnesota DNR*

The Minnesota Ground Water Association Foundation donated \$1,200 to the Bemidji Headwaters Science Center for a groundwater model to be used in their scientific programs. The Groundwater Model is an interactive classroom tool that is designed to show the flow of water through confined and unconfined aquifers as well as the effects of pumping on these aquifers. The Center had one old model that was in need of replacement. With the Foundation money, the Center was able to buy two groundwater models.

One model demonstrates the entire water cycle and includes precipitation. The other is a karst model and contains a simulated karst formation along with sand and gravel aquifers. Members of the Center's science club were the first to use the models and had a wonderful time examining them. They especially enjoyed how pumping of the model changed groundwater flow. They also learned about the water cycle and how groundwater and surface water are inter-related.

Children from the Science Club had a lot of fun "contaminating" the aquifers and then pumping them out while learning about groundwater flow. The groundwater flow models really stimulated the excitement and amazement of these children.



In addition to being available for users of the Science Center, the groundwater models are available for local educators to check out for demonstrations. The addition of these two models also has stimulated discussions of a possible main groundwater exhibit within the Science Center. If funding is obtained for a new building, a permanent groundwater exhibit may be part of the new building!

Many THANKS to the MGWA Foundation for helping the Science Center make groundwater education possible for northern Minnesota!

The Bemidji Headwaters Science Center's mission is to provide intellectual stimulation and enjoyment for all children and adults in its northern Minnesota service area with scientific and technological interactive displays, exhibits, and programs. The service area for the center includes northern Minnesota communities from the Canadian and North Dakota borders through Itasca and Koochiching Counties on the east and into Norman, Becker, Wadena, Cass, Crow Wing and Aitken Counties on the south. Their website is: [www.hscbemidji.org](http://www.hscbemidji.org). If you're ever in the Bemidji area, check out the Science Center. It is open from 9:30 am to 5:30 pm Monday through Saturday and 1 pm to 5 pm on Sunday, and is located in downtown Bemidji at 413 Beltrami Avenue.

**The MGWA Foundation is a 501(c)3 charitable organization. Donations to the Foundation are deductible on your state and federal income tax returns.**

## FOUNDATION MINUTES

**Meeting Date: Wednesday, August 3, 2011**

Location: MN Dept of Natural Resources Conference Room

Attending: Gilbert Gabanski, Amanda Strommer (via telephone), Steve Robertson, Cathy von Euw and Cathy Villas-Horns.

Review of Minutes The meeting minutes for the March 8, 2011 meeting were approved on April 23, 2011. The minutes were provided via e-mail to the MGWAF Board and the MGWA Newsletter staff.

Treasurer's Report MGWA Foundation balance as of August 2, 2011 is \$106,022.29. Interest in the amount of \$761.34 was accrued since 3/2/2011 and was swept into the endowment. Total credits of \$49 from donations to the MGWA Foundation were received during this period. Total debits of \$2700 were deducted during this period for a \$1200 donation to the Headwaters Science center and a \$1500 donation to the Metro Children's Water Festival.

The H.O. Pfannkuch Fund balance as of August 3, 2011 is \$13,611.05. Interest in the amount of \$48.23 was accrued since 3/2/2011 and was swept into the fund. Total donations of \$10 were received during this period.

There was some discussion on the use of Quickbooks 2011 to track the finances of the foundation. A request will be made to the MGWA Board to purchase updated Quickbooks software and accessories that will allow the program to run on either a Microsoft or MAC system.

Cathy met with Affinity Plus to learn about our investments and the uses of Rewards Points, which are accrued through our accounts. Cathy handed out several pages of information which describe the uses of Rewards Points and some alternative approaches to managing the investments.

Cathy recommended that the MGWA and HO Pfannkuch funds be separated into different accounts to allow for easier management. Cathy also recommended moving all but \$10 of the MGWAF savings funds into a 5-year certificate of deposit (CD) earning 2.5%. For the MGWAF Interest Reward Checking, Cathy recommended keeping \$5,000 in the account, moving \$15,000 into a 5-year CD earning 2.5%, and to move the remaining \$5,064.23 into a 1-year Wahoo Certificate earning 2%. The Step-Up CD would not be affected. The Wahoo Certificate has unlimited deposits and no penalty for early withdrawal. Cathy recommended similar options for the HO Pfannkuch funds including \$10 as a minimum balance in a savings account and moving \$5,000 into a checking account. Additional funds from savings (\$132.19) and checking (\$8,457.48) would be moved into another Wahoo Certificate. Steve recommended that at some point we consider moving money into CDs with overlapping maturity dates so that we can maximize interest and not have the money locked up for long periods. Steve moved that we accept the financial report and recommendations made by Cathy Von Euw; Cathy Villas-Horns seconded the motion. Motion passed.

Old Business MGWA Board Meeting report - The MGWA Board is working on a reduced registration fee for the Geological Society of America conference which will be held in Minneapolis in October. The MGWA is going to sponsor one of the field trips. There were about 200-300 responses to the salary survey. Preliminary results have been posted on Google bulletin board. There will be an article in the newsletter. The Midwest Groundwater Conference will be held in the Twin Cities in the fall of 2012. This will take the place of the fall MGWA conference.

New Business One grant request was received. A request for \$500 for the University of Wisconsin River Falls spring field trip was received from Dr. Kerry Keen after the trip. Dr. Keen stated that he intended to submit the application before the trip but was not able to do so. While the MGWAF board does not want to encourage people to apply for reimbursement after an event has occurred, it was determined that the board had supported the River Falls campus in the past with success and would feel comfortable doing so on this occasion as well. Cathy Villas-Horns moved that the grant request be approved for \$500. Cathy Von Euw seconded the motion. Motion passed.

Fundraising discussion: There was discussion of the possibility of fund raising by the MGWAF board to bring in additional monies to the fund. The MGWA Board provided \$12,000 in unrestricted funds that were to be used for grants. This money has been spent down.

There was also discussion of being able to provide a meaningful scholarship from interest earned off of the endowment. A committee should be formed to work on the details of the scholarship.

Next Meeting The next meeting will be in early November on a date yet to be determined.

## MGWA Foundation Board of Directors

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