

Minnesota Ground Water Association

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President's Letter

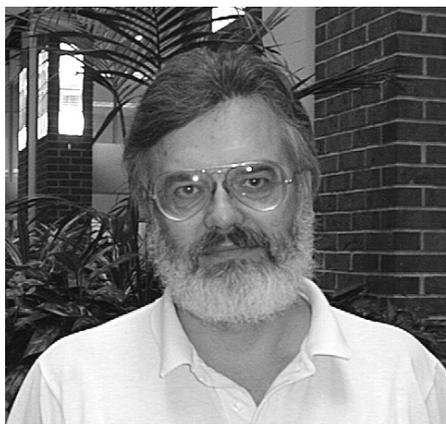
Greetings and welcome to 1998. This being my first "President's Column" I've been staring at the deadline and trying to think of something say that is not only informational but also witty and profound. In my search for ideas I've been looking at back issues of the MGWA newsletter to see what sorts of things have been written in the past (luckily for me one of my co-workers was the very first president and has newsletters dating back to Vol. 1, No. 1 in 1982). It has been very impressive reading some of these early issues and seeing the development and growth not only of the MGWA but of the newsletter itself. From the beginning the MGWA has issued a newsletter with valuable information on topical issues of importance to the groundwater industry. It is quite an honor to have the opportunity to contribute. However, the deadline is here and both wit and profundity have eluded me, so I will have to settle for informational.

On behalf of the MGWA Board, I'd like to thank Gretchen Sabel the outgoing Past President for her past 3 years of service. Gretchen did a great job and has been a strong contributor to the success of the MGWA, not only over the last 3 years, but in previous



— Paula Berger, MGWA President, 1998.

years serving as treasurer and contributing newsletter articles. Through her dedication, hard work, and insight, the MGWA has grown stronger and flourished as an important resource for ground water professionals. We welcome Jim Piegat to the MGWA board as the new President-Elect. We look forward to working with him over the next few years.



— Jim Piegat, MGWA President-Elect

Also, congratulations to Jan Falteisek on her re-election as secretary. We are pleased (not to mention relieved) that she is willing to continue in her position and keep us moving in the right direction over the next two years.

1998 is looking like it will be quite a busy year for the MGWA. A 1997 year-end board brainstorming session produced many good ideas for future conferences and meetings including naturally occurring contaminants, risk-based cleanup goals vs. non-degradation cleanup policy, urban contaminants, Twin Cities water supply development, and several others. Our spring meeting will be held on April 17th and will focus on brownfields issues and how they relate to groundwater and regional groundwater resources. This year the MGWA

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Continuing Education Rules Proposed for Geoscientists

The Continuing Education Task Force recommended proposed rules for continuing education requirements that will affect licensed geoscientists. The rules were approved by the Minnesota Board of Architecture, Engineering, Land Surveying, Landscape Architecture, Geoscience and Interior Design (AELSLAGID), and will likely be noticed in the State Register as this newsletter goes to print. A hearing is expected.

The proposed rules require the 24 hours of continuing education (personal development hours) on a biennial basis. Such education must consist of "learning experiences which enhance and expand the skills, knowledge, and abilities of practicing professionals to remain current and render competent professional services to the public." (Minn. Rules 1810.0400) Categories of activities that will satisfy the rules include the following:

- College courses;
- Correspondence, internet, video, or audio courses;

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The primary objectives of the MGWA are:

- Promote and encourage scientific and public policy aspects of ground water;
- 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.

Proposed rules for continuing education of geoscientists, cont.

- Seminars, tutorials, short courses;
- In-house educational programs;
- Presenting qualifying courses or seminars;
- Authoring published papers, including preparation time;
- Professional examination grading or writing;
- Providing professional service to the public which draws on practitioners professional expertise on boards, commissions, and committees (i.e., planning commissions, building code advisory boards);
- Patents; and
- Verifiable self-directed study

Some categories of eligible activities have limits on the number of hours that can be used per biennium, such as 10 personal development hours for working on a patent. Licensed professionals will be permitted to carry over up to 12 hours from one biennium to another.

Some exemptions to this proposed requirement are available for extenuating circumstances. Documentation will be the responsibility of the licensee, and, if the proposed rules are promulgated, the documentation must be furnished to the Board of AELSLAGID in order to renew the license.

President's Letter, cont.

will be spearheading the annual fall field trip, and while that seems months away, we are always looking for ideas and volunteers to help plan this event. We would like to create a position on the board for a field trip coordinator. We are also hoping to update the by-laws in 1998 in order to clarify board member responsibilities and voting rights and to possibly extend full board membership and voting rights to additional board members. This will help particularly in the event of a tie. We would like to expand the scholarship program and are considering ways to set up scholarships funded by various private entities through the MGWA. We are discussing various ways to educate developers, city planners, and lenders on groundwater resources, particularly in areas where aquifers are easily susceptible to surface contamination. And finally, as you probably read in the last newsletter, the MGWA has also started a web page (www.mgwa.com) and we now have the ability to communicate with the entire world! As the web page is still being formed, we are looking for ideas on what sorts of things you would like to see there. Check it out and send us any ideas or comments.

At the last MGWA board meeting Jan pointed out that most people in the everyday world outside of our profession don't have any idea what "ground water" is. Think about how many of your family members or friends really understand what you do. How do you describe your job to a stranger you just met? If I say "hydrogeologist" often people just smile and nod. Thanks to "Volcano" and "Dante's Peak" a few years ago, most people now know what geologists do (rescue people from killer volcanoes, of course) but until we get an action series on TV about groundwater professionals (if you know any screen writers, send them my way, I've got the first few episodes already worked out), we need to continue to educate people about one of the most difficult resources to visualize yet one of the most important resources to our day-to-day existence and future well-be-

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ing. This is one of the challenges to the MGWA in the future.

According to the very first newsletter, the focus of the MGWA is not on our profession but on ground water itself. 1998 would be a good year to expand your involvement in educating others on the importance of understanding what ground water is and in protecting this resource as an investment in the future. One way to do this, of course, is to become involved in the MGWA. We have many ideas but need involved, dedicated and dynamic people to help carry them out.

— Paula Berger, MGWA President, 1998

University of Minnesota offers new "Aquifer Systems" course

The University of Minnesota Department of Geology and Geophysics has announced a new spring semester course entitled "Aquifer Systems" (Geo 5980). Instructors will be Mark Person (mperson@darcy.geo.umn.edu), Olaf Pfannkuch (pfann001@maroon.tc.umn.edu), and Calvin Alexander (alexa001@tc.umn.edu). The course will be offered MWF 11:15 - 12:05, 121 Pillsbury Hall.

This course will provide students with an overview of important aquifer systems of Minnesota and North America, and geologic, geochemical, and quantitative methods used for aquifer characterization. Aquifer systems to be considered include: shallow glaciofluvial aquifers of Minnesota; confined Paleozoic aquifer system of Twin Cities Basin; karst aquifer systems of SE Minnesota and Florida; rift aquifer systems of the Rio Grande Valley; deltaic aquifer systems of the Gulf of Mexico; and fractured bedrock aquifers. Students will learn how to interpret geophysical borehole logs, geologic maps, numerical models, isotopic tracer data, water level information, aquifer test analysis, and geochemical data to infer groundwater flow patterns, groundwater residence times, and estimate safe yield.

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New U of M Aquifer Course, cont.

Class Outline

Background:

- Review of Darcy's law and subsurface transport equations (Pfannkuch)
- Aquifer stratigraphy and characterization of fractured bedrock permeability (Pfannkuch)
- Aquifer test and isotope tracer test analysis (Person)
- Geologic map and geophysical well log interpretation (Val Chandler—MGS)
- Geology and hydrologic controls on groundwater flow patterns (Pfannkuch)
- Chemical evolution of natural water (Alexander)

Aquifer Systems of Minnesota

- Shallow glacio-fluvial watersheds of north central Minnesota (Alexander)
- Deep confined Paleozoic aquifer system of Twin Cities basin (Alexander)
- Karst aquifers of SE Minnesota (Alexander)

Aquifer Systems of North America

- Gulf Coast Aquifer System - excess pressure generation, thermohaline convection, fate of oil field brines (Person)
- Rio Grande Valley Rift Aquifer System - role of faults and rift stratigraphy on flow patterns, mining of groundwater in Albuquerque Basin by over pumping (Person)
- Fractured bedrock aquifers of Mirror Lake, New Hampshire & Yucca Mountain (Pfannkuch)
- Floridan aquifer system - salt water intrusion problems, dewatering and the everglades, nutrient loading (Alexander)
- Shallow glacio-fluvial, sole-source aquifer system of Nantucket Island, Massachusetts - salt water intrusion from over pumping, well head delineation of Municipal well fields (Person)
- Shallow fluvial aquifer of Arkansas River Valley - groundwater-surface water interactions and reduced stream flows due to over pumping, aquifer salinization (Person)

Dr. Tom Winter Speaks to a Full House at the University

A lecture room full of people gathered on January 22, 1998 in Pillsbury Hall, to hear Dr. Tom C. Winter talk about his research on the relationships between ground water and surface water. Dr. Winter is a research hydrologist with the USGS in Denver, and has strong ties to Minnesota since he earned a Ph.D at the University of Minnesota and has conducted research in northern Minnesota for many years.

Dr. Winter has earned a reputation as an expert on ground water - surface water interactions in many years of research with the USGS, including much important work on ground water - lake interactions. His talk summarized some of this work and presented the results of recent research on estimating aquifer recharge using surface water measurements.

Most of the introductory part of Dr. Winter's talk was a survey of some of the key research findings with respect to ground water relationships with lake systems since Toth's seminal article on local, intermediate and regional flow system was published in 1962 (J. Geophys. Res., v. 67, pp. 4375-4387). Since then Winter and others have established the importance of site specific conditions, namely transient changes in water table configuration, anisotropy, and other geologic factors. Much of the research he summarized was synthesized from field observations from lake settings in New Hampshire, Minnesota, North Dakota, Nebraska, and Florida. Practical constraints (money, time, access) on the nature and amount of field observations that he could collect would necessitate that the field data be integrated into a modeling analysis for hypothesis testing. Much of his work benefitted greatly from fully 3-D modeling analyses of ground water-lake interactions.

The overview Dr. Winter provided in the beginning was prologue to the last part of his presentation in which he talked about ground water-surface

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Capillary Fringe — March 1998

by Jim Lundy, Issue Editor

When “The Capillary Fringe” first appeared in December 1997, the MGWA newsletter editorial team was lucky to have “Joe Spews” already in hand. It was an entertaining read with a well-taken point, delivered in a roundhouse style we felt sure would generate reader commentary. For the March 1998 issue we planned to just run some of the numerous expected response letters—these would be at least as entertaining as “Joe Spews” itself — and maybe sustain a written conversation spanning several future issues.

Well, so far there aren't any comments in our mailbox; either Joe hit a home run on the first pitch, or the readership is still reeling from his clarity and audacious wit. Either way, it leaves me, the March 1998 newsletter issue editor, scrambling beneath a looming deadline for something, *anything*, to give the typesetter.

For a time the newsletter editorial team (an intrepid and highly literate crew, consisting of Jan Falteisek, Steve Robertson, Tom “The Red Pencil” Clark, and myself) discussed running an item off the Internet (thanks to Tim Thurnblad) concerning the hydrogeology of Mars. This was interesting (finally! somebody has combined the space program, my boyhood passion, with my profession! By the way, to what depth will a peristaltic pump work in a Martian monitoring well?), yet slightly beyond the MGWA jurisdiction, especially for us public sector types.

I then considered whipping up a “Capillary Fringe” opinion piece discussing one of my pet peeves. While it's generally known in our business that cleanups do not return aquifers to pristine condition (“Much Ground Water Can't Be Cleaned Up” (editorial), John Bredehoeft, Ground Water Journal, volume 30, number 6, page 834, November-December 1992), very few in our profession advertise this point. And no wonder. What company or government agency wants to appear to be doing a lousy job? It's much more fun to present a success

story than an utter failure to an international conference.

There is irony in our “head in the out-wash sand” refusal to publicize our remedial shortcomings. If the public sees the emperor naked, when the public judges the implied promise of environmental cleanup to remain largely undelivered, then our profession faces the potentially embarrassing question “well, what are we paying you for?!” Of course, recent efforts to more carefully frame the environmental problems to be solved (the “risk-based approach” to investigation and cleanup) will do much to even the playing field between public expectation and hydrogeologic reality. Still, had I chosen this for a topic for my contribution to the Capillary Fringe, I would have encouraged us all to do our best to educate non-experts and to de-mystify our science.

I made my own small effort in this direction on a recent car trip with three friends, Madison-bound. As we rolled down I-94 looking for the edge of the driftless area, I asked each non-expert what they believed to be the pressing ground water issues of today. The first, a city planner, thought septic tanks were most important. The second, a small business owner, said ground water professionals ought to ensure safe drinking water at all times. The third friend had fallen asleep by this time, which I am certain was in response to the vigor of our debate.

Perhaps their reactions to my questions define a useful microcosm of opinions held by our customers. Some, knowledgeable in related fields, have intense interest in special issues like septic tanks. Some simply have an almost religious belief in the right to clean water to drink. And of course, some are asleep in the backseat.

Well, the deadline no longer looms; it is past. Now that you've struggled through this hastily prepared stopgap installment of “The Capillary Fringe”, and now that I've

been through the pain of writing it, let me make my plea. Most everyone has thoughts from beyond the fringe, so let's hear them. Perhaps there are yet some readers itching to respond to “Joe Spews” — start writing! Or perhaps someone would like to take us in a wholly different direction with their own full-length column. In the Capillary Fringe. The rules of the saturated zone do not apply; we hope it is a rarefied place for musing, for brainstorming, perhaps for a little non-linear thinking. The podium is yours.

Tom Winter's Talk, cont.

water landscapes (hydrogeomorphic regimes) that he has studied as part of recent efforts to improve our ability to estimate recharge in small systems. He presented a map of the United States in which 24 different ground water-surface water landscapes had been delineated. In the context of those regimes he presented evaluations of recharge and baseflow in small drainage basins, some of which is presented in a 1997 publication (Mau and Winter, 1997, Ground Water, v. 35, pp 291-304). In his presentation, however, Dr. Winter presented results that showed application of the existing methods and approaches in small basins results in estimates of ground-water recharge that vary in quality from one ground water surface water landscape to another.

The strong attendance at this talk, on the heels of a popular fall MGWA conference on ground water - surface water interactions, serves as confirmation that many in our field find ground water - surface water relationships intriguing and seek opportunities to learn more about them.

Hydrogeology and Pollution Sensitivity of the St. Peter-Prairie du Chien-Jordan Aquifer in Rice County, Minnesota

— by Moira Campion, DNR Waters

Introduction

The Minnesota Department of Natural Resources recently published Part B of the Rice County Geologic Atlas. The Rice County Atlas is the ninth in the series of county Geologic Atlases produced through the joint effort of the Minnesota Geological Survey and the Minnesota Department of Natural Resources. Since 1993 the County Geologic Atlases have been published in two parts. Part A of the Rice County Geologic Atlas describes the geology and data base in the following six plates: data-base map, bedrock geology, surficial geology, Quaternary stratigraphy, depth to bedrock and bedrock topography, and geologic resources. Part B describes the hydrogeology and provides sensitivity interpretations for the ground water resources in three plates: water-table hydrogeology, bedrock hydrogeology and sensitivity to pollution.

Shown in this article are black and white versions of the bedrock hydrogeology, recharge conditions, and bedrock pollution sensitivity maps, one of three residence-time cross sections prepared for the report, and selected diagrams. This article will summarize the main features of all three plates but will emphasize the bedrock hydrogeology and sensitivity to pollution. Data collection for Part B of the Rice County atlas began in spring of 1992. In addition to the historical information in the County Well Index (CWI), three county-wide synoptic water level measurements were obtained and water chemistry and isotope samples were collected at 83 locations throughout the county.

Several new features have been incorporated into Part B to provide more information to the user. These features allow the technical user access to some of the details of the project while providing a clear picture of the hydrogeology of the county to the general user. For example, maps

show locations of water chemistry samples and water level measurements as well as tritium age dates. The Water-Table Hydrogeology map includes a color shaded-relief base of the general topography of the county, the potentiometric contours, and the area where perched conditions occur above the Decorah-Platteville-Glenwood confining unit. Three cross sections showing residence times and ground-water flow relationships are included on the Bedrock Hydrogeology plate. The plate also shows saturated thickness and potentiometric contours. The cross sections are particularly useful in visualizing ground-water flow in three dimensions. The Sensitivity to Pollution plate includes the Recharge Conditions map that illustrates geologic settings and associated recharge conditions.

The Rice County atlas was developed using Geographic Information Systems (GIS) techniques, as have all atlases published since 1993. The most important advantage of a GIS data base to a county is the ability to add new data as it becomes available and make appropriate adjustments to the geologic or hydrogeologic interpretation. Maps and reports in GIS format give the user flexibility to look at features from different maps simultaneously as well as the ability to compare these maps to other GIS-based products such as census, land use, and climate data. Although development of a ground-water model does not require GIS technology, setting up the data base in GIS gives the user more capability with spatial analysis and helps to maintain the model in the future. Creating a GIS-based atlas may seem initially cumbersome because of the significant time investment needed to set up the data base at the outset, however it is very efficient at the analysis stage and when developing derivative maps such as sensitivity to pollution.

Water-Table System

The Water-Table Hydrogeology map in Part B portrays the water-table surface throughout Rice County, whether in glacial deposits or in bedrock. The topography of the county is shown as a shaded-relief map digitally derived from the U.S. Geological Survey (USGS) 1:24,000-scale Digital Eleva-

tion Model. The water table occurs in thick glacial deposits in most of Rice County. However, in the northeastern part of the county, where glacial sediments are thin or absent, the water table is in bedrock. Because so few wells are completed at the water-table surface, other sources of data were used to estimate the elevation of the water table. Development of the Water-Table Hydrogeology map relied heavily on the National Wetlands Inventory (NWI), which identifies the abundant wetlands as well as the perennial streams in the county.

In western Rice County the hummocky topography and kettle lakes are characteristic of stagnant-ice deposits, as described on the Surficial Geology plate in Part A. In this area, the water table in the glacial sediments is continuous with the surface-water bodies. The abundant lakes and wetlands and the slow, immature drainage network are expressions of the water-table system.

In southeastern Rice County, relatively thick and laterally continuous deposits of pre-Wisconsinan till overlie the Decorah-Platteville-Glenwood confining unit. In this area, unconfined conditions exist in both the surficial deposits of pre-Wisconsinan till as well as the underlying St. Peter Sandstone. Two vertically superimposed unconfined surfaces occur here. The upper surface will be referred to as the perched water table and the lower as the buried unconfined surface. The cross section shows the vertical relationship between the perched water table and the buried unconfined surface in southeastern Rice County. The perched water table in the surficial material is approximately 200 feet higher than the buried unconfined surface in bedrock.

Because of the relative absence of glacial deposits in northeastern Rice County, water-table conditions occur in bedrock. Here, the water table is in the St. Peter Sandstone. This water-table surface is the lateral extension of the buried unconfined system in southeastern Rice County mentioned above and is seen on the cross section.

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Bedrock System

The Hydrogeology of the St. Peter-Prairie du Chien-Jordan Aquifer map shows the potentiometric surface, general direction of ground-water flow, and saturated thickness. The symbols mark locations of bedrock wells where water levels were measured and/or water samples were obtained. Continuous regional bedrock aquifers underlie all of Rice County. These aquifers and the confining units that separate them occur in the Paleozoic sediments that comprise the Hollandale Embayment. The Hollandale Embayment is composed of sandstones, dolostones, limestones, and shales and occurs over a wide area of southeastern Minnesota (Delin and Woodward, 1984). Most of the wells listed in the County Well Index (CWI) data base for Rice County obtain water from the St. Peter-Prairie du Chien-Jordan aquifer, which extends throughout most of the county. In the northwest, where the St. Peter-

Prairie du Chien-Jordan aquifer has been removed by erosion, wells are completed in the St. Lawrence Formation or the Franconia sandstone. The St. Lawrence Formation is not often used as a source of water because it is a confining unit over most of its subcrop area. The hydrogeology of the St. Lawrence-Franconia low-yield aquifer is discussed in more detail in the atlas.

Ground water flows north from a regional potentiometric divide south of the county to the Minnesota and Mississippi Rivers. These rivers are regional discharge boundaries for these aquifers. In northeastern Rice County, the St. Peter-Prairie du Chien-Jordan aquifer discharges locally to the Cannon and Straight Rivers. The cross section shows the general flow directions of the water-table system and the St. Peter-Prairie du Chien-Jordan aquifer. The saturated thickness of the St. Peter-Prairie du Chien-Jordan aquifer is greatest in the south-central part of the county where the entire unit is present and

fully saturated, and least in the west-central and northwest where the subcrop has been partially or completely removed by erosion. Water-level relationships between the water-table system, Quaternary buried confined aquifers, and the bedrock aquifers are diagrammed in Figure 1.

Decorah-Platteville-Glenwood Confining Unit

The Decorah Shale, Platteville Formation, and Glenwood Formation together act as a confining unit, hydrologically separating the Galena aquifer and/or the Quaternary water-table system from the St. Peter-Prairie du Chien-Jordan aquifer. This bedrock confining unit is present in southeastern Rice County. Typically a confining unit acts as an upper boundary to an aquifer, impeding the upward movement of ground water and resulting in confining pressure. Throughout much of the subcrop area of the Decorah-Platteville-Glenwood confining unit in Rice County the underlying St. Peter-Prairie du Chien-Jordan aquifer is unconfined. Here, the confining unit acts as a lower boundary to the Galena aquifer and/or the Quaternary water-table system, but not as an upper boundary to the St. Peter-Prairie du Chien-Jordan aquifer. In this area, there is a perched water-table system overlying the unconfined St. Peter-Prairie du Chien-Jordan aquifer. The cross section shows the unsaturated bedrock beneath the Decorah-Platteville-Glenwood confining unit in southeastern Rice County.

St. Peter-Prairie du Chien-Jordan Aquifer

The St. Peter Sandstone, Prairie du Chien Group, and the Jordan Sandstone have been grouped into one aquifer unit in Rice County. The limited scope of this study did not allow for clear separation of these units into distinct aquifers. Runkel (1996), however, reported distinct hydrogeologic units within these rock units in the Rochester area. The St. Peter-Prairie du Chien-Jordan aquifer underlies all of the county except for small areas in west-central and extreme north-western Rice County.

The saturated thickness of this aquifer ranges from zero to greater than

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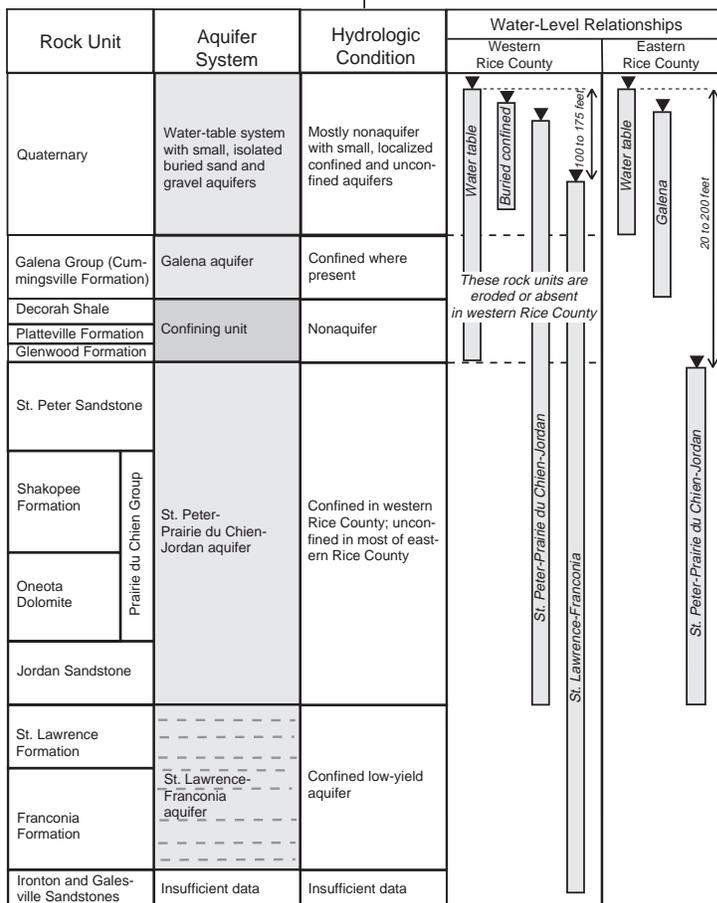
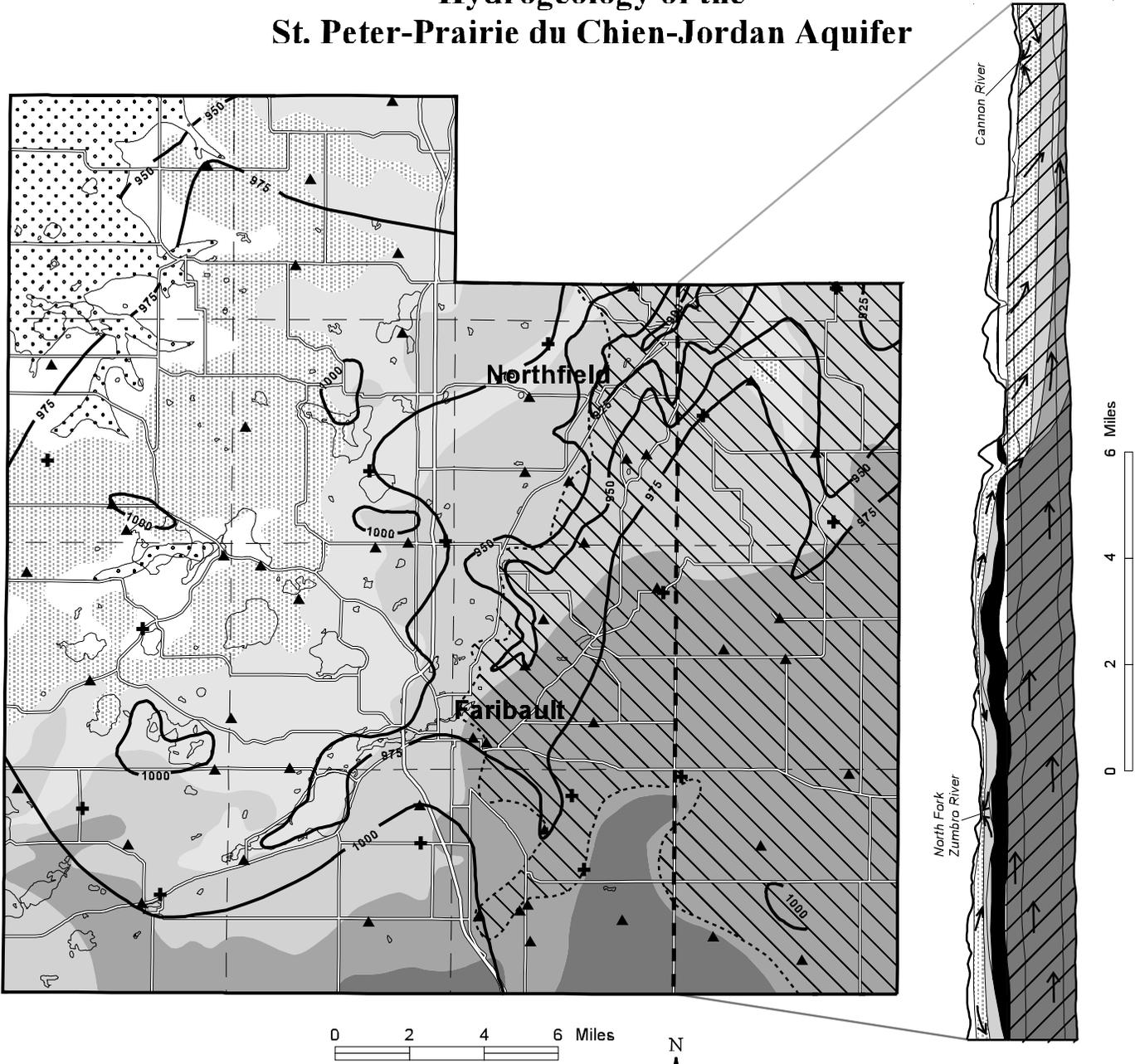


Figure 1: Sequence of aquifers and water level relationships in Rice County

RICE COUNTY, MINNESOTA

Hydrogeology of the St. Peter-Prairie du Chien-Jordan Aquifer



Map Legend

- Potentiometric contour
- Cross section
- Well sampled for chemistry
- Well measured for water level, but not sampled

Saturated thickness in feet

- 0-100
- 100-200
- 200-300
- 300-400
- 400-500
- 500-600
- Aquifer absent
- Aquifer unconfined; aquifer confined to west

Cross Section Legend

- Unsaturated
- Recent waters; tritium >10 TU
- Mixed waters; 1 < tritium < 10 TU
- Vintage waters; tritium < 1 TU and between 50 to 5,000 years old
- Vintage waters; tritium < 1 TU and more than 5,000 to 10,000 years old
- Decorah-Platteville-Glenwood
- Confining unit
- St. Peter-Prairie du Chien-Jordan aquifer
- Direction of groundwater flow

Rice County Atlas, Part B, cont.

500 feet. South and west of the confined-unconfined boundary saturated thickness is the combined thickness of the three geologic units. North and east of this boundary, saturated thickness is the height from the base of the Jordan Sandstone to the top of the unconfined potentiometric surface in the St. Peter Sandstone. Saturated thickness is greatest in the southern part of the county, where the entire thickness of the St. Peter Sandstone, Prairie du Chien Group, and Jordan Sandstone is present under confined conditions, and decreases to the north and west.

The potentiometric surface of the St. Peter-Prairie du Chien-Jordan aquifer is highest in southwestern Rice County and lowest along the Cannon River in the northeast. This south-to-north flow direction is consistent with regional hydrogeologic studies of the Hollandale Embayment (Delin and Woodward, 1984). Approximately five miles south of Rice County is an east-west-trending regional ground-water divide. This regional ground-water divide corresponds to a topographic high and surface-water drainage divide. North of the county, the aquifer discharges to the Minnesota and Mississippi Rivers. Locally, ground water is discharged to the Cannon and Straight Rivers and also to Prairie Creek in Northfield Township. The influence of these streams creates a local east-west component to the ground-water flow system.

Sensitivity to Pollution

The Sensitivity to Pollution map describes the sensitivity of the St. Peter-Prairie du Chien-Jordan aquifer using a model based on vertical ground-water flow behavior. In the extreme northwestern corner of the county where the aquifer is missing, the pollution sensitivity rating applies to the St. Lawrence-Franconia low-yield aquifer. The Recharge Conditions map shows how water may travel from the surface to the aquifer through both vertical and horizontal flowpaths. The sensitivity of an aquifer to pollution is the relative ability of overlying geologic materials to restrict the downward migration of water and contaminants to an aquifer of interest. The Minnesota Groundwater Protection Act of 1989 states that a sensitive area is "a geographic area defined by natural features where there is a significant risk of groundwater degradation from activities conducted at or near the land surface." The "natural features" stated in the Act are the geologic conditions in an area, such as type of bedrock or surficial materials. This approach is called intrinsic or geologic sensitivity.

Recharge Conditions

The Recharge Conditions Map of the St. Peter-Prairie du Chien-Jordan and the St. Lawrence-Franconia aquifers displays areas with different recharge characteristics. The map shows eight distinct hydrogeologic conditions that influence recharge to these aquifers. These conditions account for both vertical and horizontal ground-water flow behavior and are

directly related to the geological deposits which overlie the aquifers. The Recharge Conditions Map was developed from the geologic maps in Part A, as well as hydrogeological information collected during this study. Although horizontal flow of ground water is not considered in the Department of Natural Resources model of pollution sensitivity, horizontal flow has a significant role in understanding Rice County's ground-water system.

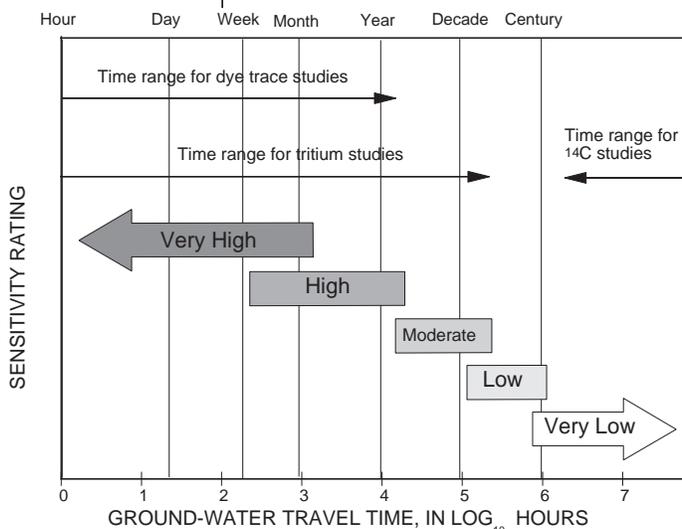
The area with the most direct recharge to the aquifer is in northeastern Rice County where the St. Peter Sandstone or the Prairie du Chien Group is at or near land surface. In this area (map unit **aqs**), water enters the aquifer readily from the land surface through the unsaturated zone, moving through pore spaces and fractures in the rock.

Three map units show areas that are characterized by strong horizontal flow: the exposed and buried subcrop edge of the Decorah-Platteville-Glenwood confining unit (maps units **ecu** and **bcu**, respectively) and alluvium and outwash deposits (**alo**), particularly where they occur over less permeable sediments. The ground water in these deposits does not recharge the underlying aquifer in a direct vertical manner over a large area. Instead, horizontal flow through these units can deliver large volumes of ground water to limited areas in the underlying bedrock aquifer.

Sensitivity Interpretation

The Sensitivity to Pollution of the St. Peter-Prairie du Chien-Jordan Aquifer map was developed based on geologic interpretations in Part A and the hydrogeologic maps and cross sections developed for the water-table and bedrock systems plates in part B. The Recharge Conditions map was also used to construct the map. The map shows the estimated travel time of water from the land surface vertically downward to the St. Peter-Prairie du Chien-Jordan aquifer, with no consideration of horizontal flow. The Sensitivity Rating Matrix illustrates the factors considered. The geologic sensitivity ratings are shown in comparison to ground water-age dating techniques in Figure 2. The

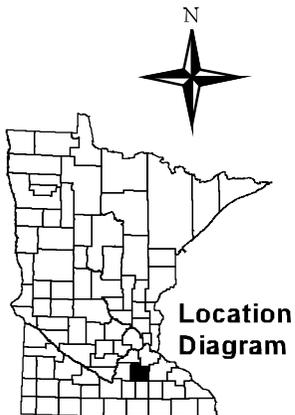
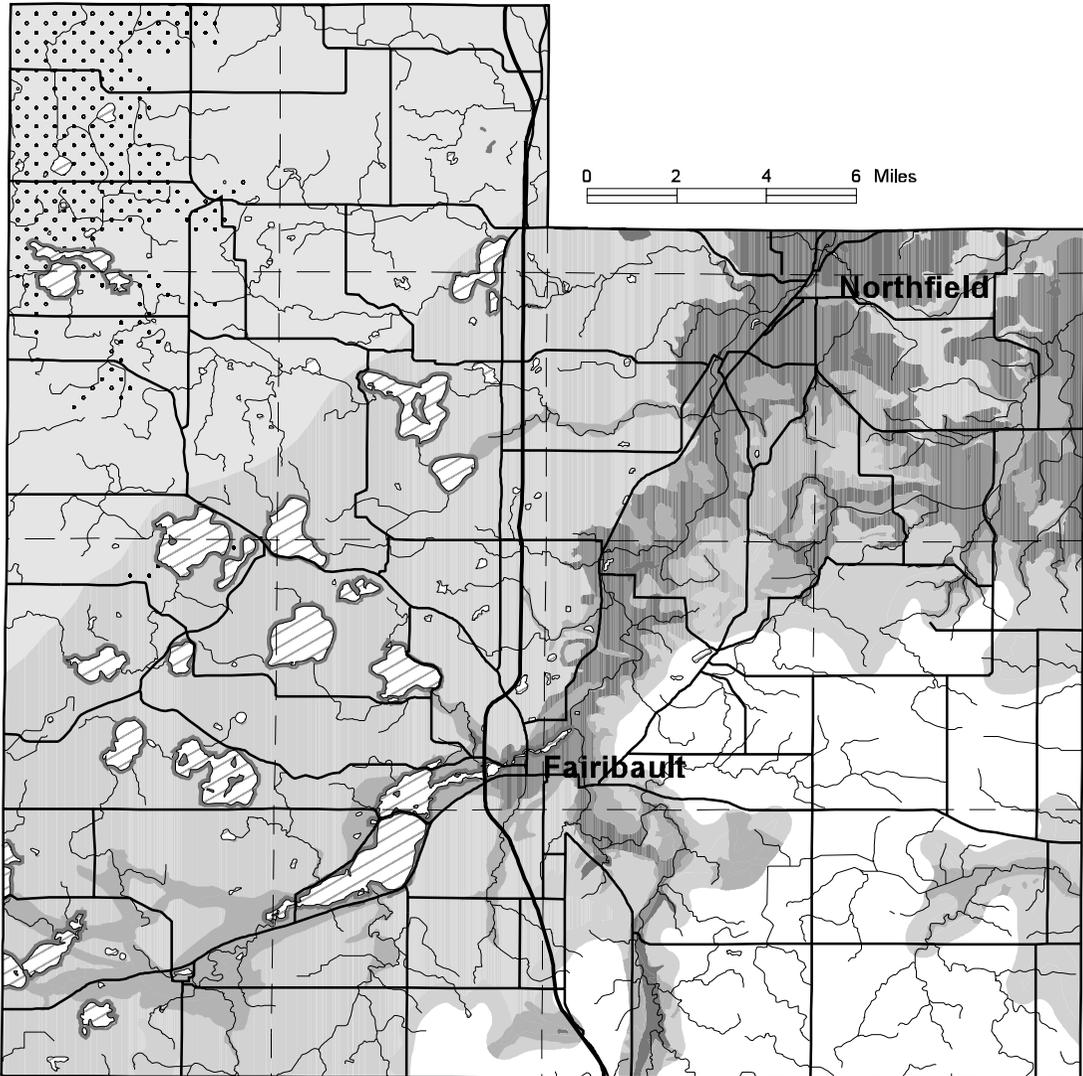
FIGURE 2. Geologic sensitivity ratings are based on the time required for water at or near the surface to travel vertically to the water table or other ground water of interest. Longer travel times imply a lower sensitivity to pollution. Dye trace, tritium, and ¹⁴C studies can indicate the relative ages of ground water.



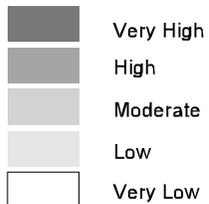
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RICE COUNTY, MINNESOTA

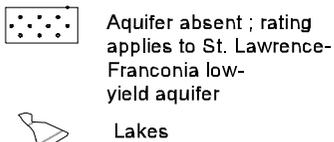
Sensitivity to Pollution of the St. Peter-Prairie du Chien-Jordan Aquifer



Sensitivity Ratings



Other Features



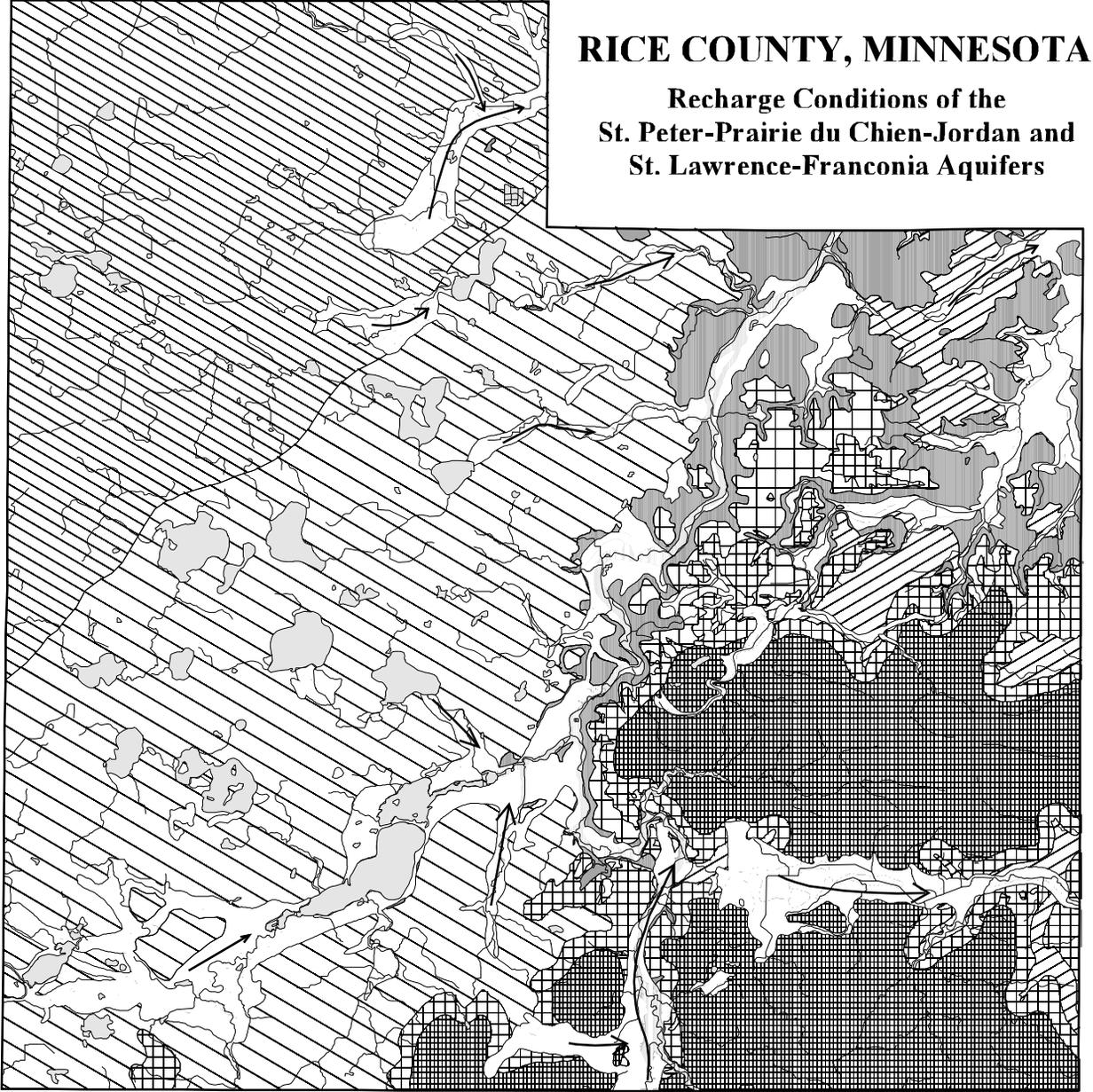
Matrix for Rating St. Peter-Prairie du Chien-Jordan Aquifer Sensitivity

		Decorah-Platteville-Glenwood Confining Unit			
		Absent	Eroded edge	Continuous	
Rock, Sediment, or Other Feature	Bedrock at or near surface	VH	H	VL	
	Alluvium	VH	VH	VL	
	Lakeshore	VH		VL	
	Alluvium over till	M*	H	VL	
	Till	Pre-Wisconsinan	M	VL	VL
		Des Moines lobe with lakes	M		
Des Moines lobe with few lakes		L			

* High in selected stream areas; Low in the northwestern part of the county where the Des Moines lobe till is thick and there are few lakes.

RICE COUNTY, MINNESOTA

Recharge Conditions of the St. Peter-Prairie du Chien-Jordan and St. Lawrence-Franconia Aquifers



Description of Map Units

0 2 4 6 Miles



 **aq_s** - Aquifer at or near the surface, water infiltrates directly into the aquifer

Areas with significant horizontal ground-water flow

 **alo** - Alluvium or outwash

 **ecu** - Decorah-Platteville-Glenwood confining unit edge with less than 50' cover

 **bcu** - Decorah-Platteville-Glenwood confining unit edge with greater than 50' cover

Areas with both vertical and horizontal ground-water flow

 **tpw** - Pre-Wisconsinan till

 **twl** - Thin late Wisconsinan Des Moines lobe till with lakes

 **tfl** - Thick late Wisconsinan Des Moines lobe till with few lakes

Area of bedrock confining unit

 **ccu** - Continuous Decorah-Platteville-Glenwood confining unit

 Lakes

 Probable horizontal ground-water flow in alluvium or outwash

Rice County Atlas, Part B, cont.

thickness and hydrogeologic character of tills and the uneroded Decorah-Platteville-Glenwood confining unit are the most significant factors for interpreting sensitivity to pollution in Rice County. The sensitivity interpretation simplifies the hydrogeological conditions that affect these aquifers and should be applied in conjunction with the Recharge Conditions map.

The county can be broadly divided into four sensitivity regions: High and Very High where the aquifer or the edge Decorah-Platteville-Glenwood confining unit has less than 50 feet of sedimentary cover or is covered by alluvium or outwash; Moderate where the aquifer or the edge of Decorah-Platteville-Glenwood confining unit has greater than 50 feet of sedimentary cover; Low where the aquifer is under thick Des Moines lobe till without many lakes; and Very Low where the aquifer is beneath the continuous Decorah-Platteville-Glenwood confining unit. Lakeshore for larger lakes has been rated Very High because lakeshore is considered a likely area of recharge to the underlying aquifer.

Water Chemistry and Isotope Results

Bedrock wells were sampled at 60 locations throughout the county. In addition to field parameters, cations, anions, and tritium were analyzed in samples from the Galena, St. Peter-Prairie du Chien-Jordan, and St. Lawrence-Franconia bedrock aquifers. Water from the Galena and St. Peter-Prairie du Chien-Jordan aquifers is classified as calcium bicarbonate water, whereas water from the St. Lawrence-Franconia aquifer is classified as calcium-magnesium bicarbonate (Fetter, 1988). Additionally, the sodium concentration in samples from the St. Lawrence-Franconia aquifer is noticeably higher than in the other aquifers in Rice County.

The results of tritium analyses may be used to evaluate the sensitivity map as a predictor of the ground-water time of travel from the surface to the sampled well. The tritium data are generally consistent with the location of the four broad sensitivity regions mentioned above. Sixty-five percent of the samples had no detect-

able tritium (vintage water) and thus infiltrated the land surface before 1953. More than ten tritium units (TU) were detected in 14 percent of the samples and these are considered recent waters. Twenty-one percent of the samples had tritium concentrations between the detection limit (0.8 TU) and 10 TU and are referred to as mixed. These tritium results were compared to the average concentration of nitrate (expressed as nitrogen) and chloride in the samples. Elevated amounts of nitrate or chloride in well samples are considered an indication of human activity. Recent waters have the highest concentration of nitrate and chloride, and the vintage waters have the lowest.

The age of water in 11 wells having samples without detectible tritium was estimated using radiocarbon dating. The results show that the presence of the Decorah-Platteville-Glenwood confining unit is the most important hydrogeologic criterion influencing the age of ground water in Rice County. Beneath this unit, inward from its eroded edge, water in east-central and southeastern Rice County is found to be greater than 10,000 years old. Where this bedrock confining unit is absent, most samples had ages less than the range of ^{14}C dating but greater than the range of tritium dating. Therefore, if not confined by the Decorah-Platteville-Glenwood confining unit, most of the ground water in the bedrock aquifers in Rice County is not greater than a few centuries old.

For Further Information

County Geologic Atlases are available from the Minnesota Geological Survey, (612) 627-4782. Additional information on current atlas and related studies is posted on the Survey's web page, <http://geolab.geo.umn.edu/mgs>. For further information, including availability of data and ARC/INFO coverages of maps in the Rice County Geologic Atlas, contact the Survey, (612) 627-4780 or DNR Waters, (612) 296-4800.

References

Delin, G.N., and Woodward, W.L., 1984, Hydrogeological setting and the potentiometric surfaces of regional aquifers in the Hollandale em-

bayment, southeastern Minnesota, 1970-1980: U.S. Geological Survey Water-Supply Paper 2219, 43 p.

Fetter, C.W., 1988, Applied hydrogeology, 2nd ed.: Columbus, OH, Merrill, 592 p.

Runkel, A.C., 1996, Geologic investigations applicable to ground-water management, Rochester metropolitan area, Minnesota: Minnesota Geological Survey Open-File Report 96-1, p. 15.

Birdsall-Dreiss Lecture on Evolution of Brines

The 1998 Geological Society of America Birdsall-Dreiss Distinguished Lecturer Jeff Hanor will present a talk entitled "The evolution of brines in sedimentary basins" at 3:30 pm, April 30, 1998 in 110 Pillsbury Hall on the Minneapolis East Bank Campus of the University of Minnesota. Dr. Hanor is a professor of geochemistry at the Louisiana State University in Baton Rouge, LA.

MGWA Election Results

James Piegat was elected President-Elect of MGWA. For 1998 he will serve as President-Elect, in 1999 he will become MGWA President. James Piegat is a hydrogeologist who has worked with Minnesota ground water issues since 1985. He has a bachelors degree in mechanical engineering and a masters and doctorate degree in geology from Purdue University. He has served on many advisory committees to further the protection of ground water in the State, and to promote the use of GIS technology for resource planning.

Jan D. Falteisek was elected to the position of MGWA Secretary for a second two-year term. Jan Falteisek is a hydrogeologist supervisor with the Minnesota Department of Natural Resources. She is presently technical supervisor for ground water and pollution sensitivity mapping efforts being conducted jointly with the Minnesota Geological Survey. She has an undergraduate degree in mathematics from Southwest State and a Master's degree in geology from the University of Missouri.

MGWA Newsletter Team:

Tom Clark, Editor-In-Chief

Jim Lundy, Issue Editor

Jan Falteisek

Steve Robertson

MGWA Newsletter Deadlines for 1998

Issue	Copy to Editor	Final Copy to Publisher
June (v. 17, no. 2)	5/8/98	5/15/98
September (v. 17, no. 3)	8/7/98	8/14/98
December (v. 17, no. 4)	11/6/98	11/13/98

Geoscience Licensure Grandparenting Period Ends August 5, 1998

Avoid last minute delays and submit your geoscience licensure application before the August 5, 1998 deadline for qualifying under the grandparenting provision. Applicants who fail to meet this deadline must pass the fundamentals exam and the professional practice exam. In addition, the staff at the Board of Architecture, Engineering, Land Surveying, Landscape Architecture, Geoscience and Interior Design (AELSLAGID) expect a last minute deluge of applications which will slow the approval process. Educational requirements include a baccalaureate (or higher) degree in geology, soil science, or related field. For geologists, at least 30 semester hours are required in geology. For soil scientists, at least 16 semester hours and 14 semester hours in geology are required. A minimum of 5 years of varied, non-repetitive and progressive experience is also required for licensure.

New Publications from the USGS

The USGS has recently published the following reports. For copies, contact: United States Geological Survey, Water Resources Division, 2280 Woodale Drive, Mounds View, Minnesota, 55112.

U.S. Geological Survey Water-Resources Investigations Report 97-4015, "Hydraulic properties and ground-water flow in the St. Peter-Prairie du Chien-Jordan Aquifer, Rochester area, southeastern Minnesota", by R.J. Lindgren.

U.S. Geological Survey Water-Resources Investigations Report 97-4029, "Hydrogeology and ground-water quality of confined aquifers in buried valleys in Rock County, Minnesota and Minnehaha County, South Dakota", by R.J. Lindgren.

U.S. Geological Survey Open-File Report 97-575, "1997 Floods in the Red River of the North and Missouri River Basins in North Dakota and western Minnesota", by K.M. Macek-Rowland.

U.S. Geological Survey Fact Sheet FS-023-96, "U.S. Geological Survey programs in Minnesota"

U.S. Geological Survey Fact Sheet FS-055-97, "NASQAN—A program to monitor the water quality of the nation's largest rivers", by R.P. Hooper, D.A. Goolsby, D.A. Rickert, and S.W. McKenzie.

Journal publication "Boron contents and isotopic compositions of hog manure, selected fertilizers, and water in Minnesota", by S.C. Komor.

New maps available from MGS

Mark Jirsa recently wrote to inform us about the availability of new map products from the Virginia Horn project:

Jirsa, M.A., Boerboom, T.J., and Morey, G.B., 1998, *Bedrock geologic map of the Virginia Horn, Mesabi Iron Range, St. Louis County, Minnesota*: Minnesota Geological Survey Miscellaneous Map M-85, scale 1:48,000. This includes the area from Minntac East (Virginia quad) to Aurora (Biwabik quad).

Jirsa, M.A., 1998, *Bedrock geologic map of the Midway area, St. Louis County, Minnesota*: Minnesota Geological Survey Miscellaneous Map M-86, scale 1:12,000. This covers in detail the area around the Viking Explosives company where the major Au prospect sits.

A digital tape containing tables of lithologic, structural, and geophysical attributes is being sent to DNR, so the raw data will be digitally available. Specifically, the tape includes data pertaining to some 1300 outcrop stations, including 400 samples and 1700 structural measurements. It also contains the location of and significant facts from 41 holes drilled during gold exploration. (DNR archives), and the location of thousands of drill holes and test pits made by the iron mining companies (MGS archives) will be included. An MGS report of investigations entitled "Contributions to the geology of the Virginia Horn" is in preparation. The report is a series of papers describing the lithologic, structural, geophysical, and geochemical aspects of the area; together with a discussion of alteration, mineralization, and recommendations for further exploration. Publication of the report is expected in coming months.

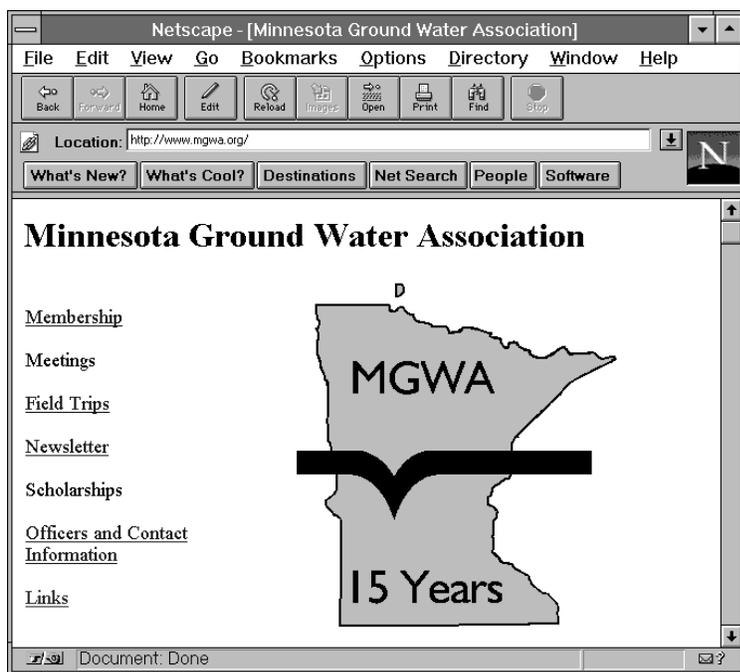
Support Your Association



MGWA Opens Web Site

MGWA is pleased to announce the availability of its World Wide Web site at www.mgwa.org. We plan to highlight membership services, provide automated reference information to our members, and promote the ground water educational goals of the organization.

You will find contact information for MGWA officers, reprints of articles from past newsletters, information on upcoming meetings and field trips, and links to other sites that complement MGWA's goals. As with most web sites, we hope to change the content as we learn more about the interests of members.



MGWA Calendar

Contact information for the major event-holders is listed at the end of the column.

March 25, 1998 Minnesota Department of Health Annual Well Conference, Thunderbird Hotel, Bloomington, MN. Contact: Ed Schneider, MDH, 612-215-0827.

March 31-April 1, 1998 Natural attenuation for remediation of contaminated sites, San Francisco, CA. Contact: NGWA.

April 2-3, 1998 Computer aided evaluation for risk-based soil and ground water cleanup, San Francisco, CA. Contact: NGWA.

April 6-10, 1998 Princeton Remediation Course, Orlando, FL.

April 17, 1998 MGWA Spring Conference—Brownfields. Brief membership meeting to follow. Minnesota History Center, 7:30-4:30.

April 20-21, 1998 Monitoring well design, construction and development, Orlando, FL. Contact: The Nielsen Environmental Field School, Inc.

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Newsletter Advertising Policy for 1998

Display ads:

Size	inches H x V	Quarterly Newsletter	1998 Membership Directory
		Annual Rate 4 issues	Annual Rate 1 issue
Business Card	3.5 x 2.3	\$60	\$45
Quarter Page	3.5 x 4.8	\$110	\$90
Half Page	7.5 x 4.8	\$205	\$170
Full Page	7.5 x 9.75	\$385	\$325
Inside Cover	7.5 x 9.75	Not Available	\$360

Classified ads:

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

E-Mail notices:

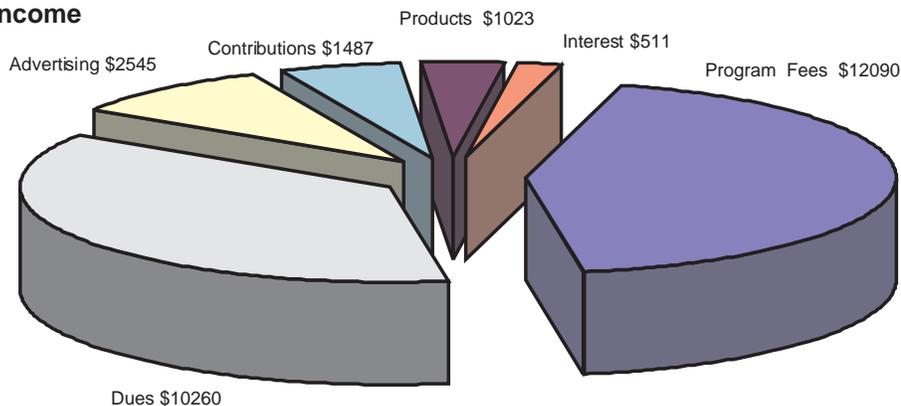
A one-time e-mailing to the membership costs \$10 for an individual (e.g. seeking a job), and \$50 for an organization (e.g., announcing a job opening). The advantage of e-mail is the speed of dissemination.

The Advertising Manager has final determination on the acceptance of materials submitted. There are no commissions on ads. Advertising copy must be received by the publication deadlines: 14 February, 16 May, 15 August, or 14 November. Photostats give the highest quality print reproduction. If a photostat is not available, high-quality copies of the ad on plain paper must be submitted for each issue published (e.g. four copies for the quarterly newsletter).

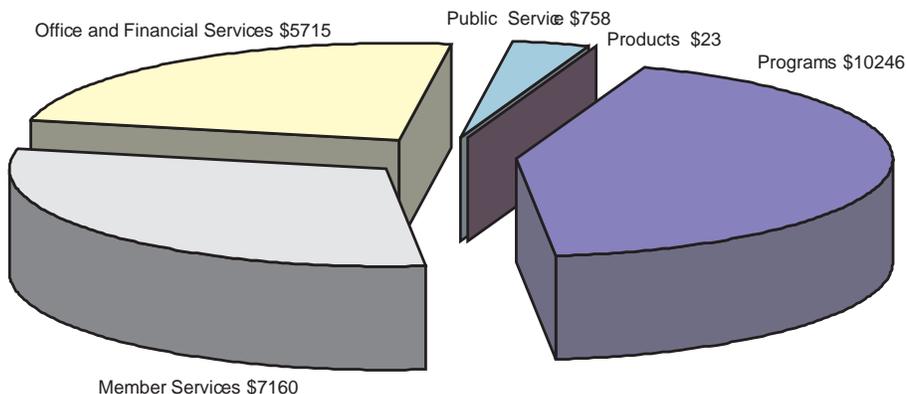
Please make checks payable to the "MGWA." Direct your orders and questions to Leigh Harrod, Advertising Manager: 220 Bell St. Excelsior MN 55331-1812, Phone: (612)474-8678; E-mail: leigh@dacmail.net

MGWA Finances - 1997 Retrospective

Income



Expenses



MGWA calendar, cont.

April 20-23, 1998 The Ground Water Sampling Field Course, Orlando, FL. Contact: The Nielsen Environmental Field School, Inc.

April 30, 1998 Birdsall-Dreiss Lecture 3:30 pm, in 110 Pillsbury Hall on the Minneapolis East Bank Campus of the University of Minnesota.

May 5-6, 1998 Minnesota Water '98 "Protecting Minnesota's Water Supplies", Minneapolis. Contact: Minnesota Water '98 Planning Committee, Water Resources Center, 1518 Cleveland Avenue, University of Minnesota, St. Paul, MN 55108.

May 6-10, 1998 Institute on Lake Superior Geology 44th Annual Meeting, Minneapolis, MN. Morning session on May 7: "Geological Overview of the Lake Superior Region—Archean to Quaternary." Contact: Jim Miller or Mark Jirsa by

phone (612-627-4780) or e-mail jirsa001@maroon.tc.umn.edu or mille066@maroon.tc.umn.edu

May 7, 1998 Practical techniques for cost-effective ground water sampling, Houston, TX. The Nielsen Environmental Field School, Inc.

May 11-12, 1998 Fundamentals of ground water geochemistry, Orlando, FL. Contact: NGWA.

May 12-13, 1998 Borehole geophysics for the ground water and environmental professional, Orlando, FL. Contact: NGWA.

May 13-15, 1998 Applications of ground water geochemistry, Orlando, FL. Contact: NGWA.

May 18-21, 1998 First International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA. Contact: The Conference Group, 1989 W.

MGWA Calendar, cont.

Fifth Avenue, Suite 5, Columbus, OH 43212-1912, (800) 783-6338.

May 20, 1998 Micropurge low-flow purging and ground water sampling, Concord, CA. The Nielsen Environmental Field School, Inc.

June 2-5, 1998 The environmental sampling field course, Columbus, OH. The Nielsen Environmental Field School, Inc.

June 8-10, 1998 Principles of ground water — fate, transport, and remediation, Columbus, OH. Contact: NGWA.

June 9-11, 1998 Understanding migration, assessment, and remediation of non-aqueous phase liquids (LNAPLs and DNAPLs), Columbus, OH. Contact: NGWA.

June 19-20, 1998 Ninth Annual Minnesota Environmental Education Conference, St. John's University, Collegeville, MN. Contact: Lee Ann Landstrom, 612-420-4300, DQJQ42A@prodigy.com

July 21-23, 1998 "When a River Runs North...", 1998 Local Water Planners Conference, University of Minnesota, Crookston. Contact: Celine Lyman, MPCA/Water Quality Division, 612-296-8862, celine.lyman@pca.state.mn.us.

July 27-31, 1998 Princeton Ground Water Pollution and Hydrology Course, Orlando, FL.

September 20-24, 1998 Fluid Flow in Carbonates: Interdisciplinary Approaches. SEPM Research Conference. Egg Harbor, Wisconsin. Pre-registration due March 15, 1998; contact Maureen Muldoon, Wisconsin Geological and Natural History Survey (608) 262-1580, or email muldoon@facstaff.wisc.edu. Abstracts due June 15, 1998.

September 27 - October 2, 1998 Gambling with Groundwater. Physical, Chemical, and Biological Aspects of Aquifer-Stream Relations Las Vegas, Nevada. Contact: AIH.

October 12-14, 1998 43rd Annual Midwest Ground Water Conference, Lawrence, Kansas

— continued on next page

MGWA Calendar, cont.

Contacts:

for NGWA events:

1-800-551-7379 or
<http://www.h2o-ngwa.org>

for GSA events:

<http://www.geosociety.org>

for Princeton's events:

<http://www.princeton-groundwater.com> or email:
info@princeton-groundwater.com

for Nielsen Environmental Field School, Inc. events:

David M. Nielsen, 4686 State Route 605 S., Galena, OH 43021. 614-965-5026. 614-965-5027 (fax)
email: nielsenfieldschool@juno.com

for Wright State University events:

WSU, Center for Ground Water Management, 3640 Colonel Glenn Hwy, 056 Library, Dayton, OH 45435. (513) 873-3648, IRIS@desire.wright.edu; http://biology.wright.edu/cgwm/cgwm_home.html

for AIH events:

AIH, 2499 Rice Street, #135, St. Paul, MN 55113-3724. (612)484-8169. (612) 484-8357 (fax). e-mail: AlHydro@aol.com

for Midwest Geosciences events:

Midwest GeoSciences Group, Suite 137, 931 West 75th Street, Naperville, IL 60564.

MGWA Board Meeting Minutes

November 6, 1997, Egg & I, University and 280, 7:30 a.m.

Attending: Gretchen Sabel, Past-President; Ray Wuolo, President; Paula Berger, President-Elect; Paul Bulger, Treasurer; Jan Falteisek, Secretary; Tom Clark, newsletter editor; Leigh Harrod, advertising; Jennie Leete, Sean Hunt, WRI.

Approval of Minutes — Ray Wuolo called the meeting to order at 7:40 a.m. Minutes for October were approved.

Fall Conference: Seminar of Surface-Ground Water Interaction — Jennie noted that 41 registrations had been received and were "climbing fast". Ray said he had contacted the USGS for handouts; arrange-

ments for copying and distributing material was discussed. Audio-visual arrangements were discussed. Ray will call Jim Almendinger about lodging for USGS presenters. Jennie will bring MGWA banner, pop, products, and registration supplies. Lunch arrangements were discussed; Gretchen will contact the caterer, Cafe Capitol, to order 60 box lunches.

Birdsall-Dreiss Lecture — Sponsorship of the GSA Birdsall-Dreiss lecture was discussed. It was noted that requests for the NGWA Darcy lecture were due Oct. 31st. Jan to contact Olaf Pfannkuch at the University of Minnesota Geology Dept. to discuss lecture sponsorship and arrangements.

Fall Field Trip — A short review of the "post-mortem" meeting was provided by field trip committee members. All or nearly all bills had been received and financially the field trip will probably break even, but not by much. Some suggestions were offered to better control expenses, e.g., filling both buses closer to capacity when it was clear two buses would be needed.

Election of Officers — Bob Beltrame and Jim Piegat are candidates for President-Elect. Leigh Harrod said she would update Jim Piegat's bio for the ballot. Jan Falteisek will be the unopposed candidate for Secretary.

Newsletter/Directory Update — Tom Clark reported on newsletter preparation. Material is being assembled for handing over to WRI for layout on Nov. 15th. No problems were noted. Tom noted that the newsletter team is scheduled to meet next week.

Scholarships — Paula said the 1998 scholarship letters were "in the mail".

Membership Renewal — Membership renewal was discussed. Renewal letters are scheduled to go out late in the year.

Web Page — Ray asked about development of a web page for the MGWA. Sean Hunt said WRI managed web pages for two other organizations. He said there was a \$50 setup fee and a \$20 per month

charge by the server. An extra \$50 is required to have MGWA.ORG. Server charges would be about \$500 per year. Sean suggested that the web site could include text version of past newsletters, Board meeting minutes, description and ordering information for products. Sean also described alternative web server sources. Jennie suggested reserving MGWA.ORG for future use. After discussion, it was moved, seconded and passed to spend \$100 for two years for MGWA.ORG. An amendment to the motion was added to include the \$50 server setup charge and the \$20 per month server service charge. Meeting adjourned 8:35 a.m.

December 4, 1997, Egg & I, University and 280, 7:30 a.m.

Attending: Gretchen Sabel, Past-President; Ray Wuolo, President; Paula Berger, President-Elect; Paul Bulger, Treasurer; Jan Falteisek, Secretary; Tom Clark, newsletter editor; Leigh Harrod, advertising; Jennie Leete, Sean Hunt, WRI.

Approval of Minutes — Ray Wuolo called the meeting to order at 7:40 a.m. Minutes for November were approved with a few typographical changes.

Fall Conference — Seminar on Surface - Ground Water Interaction — Post-Mortem - Financial summary was given, noting that \$3,380 in registration fees were received. Ray said that host expenses were about \$100; other bills were still coming in. Jennie noted that all field guides available for sale were sold — the few remaining will be sent to libraries for their collections. Ray noted that he has handouts from the speakers and could forward copies on request.

Fall Field Trip Follow-up — Final expenses for the field trip were reviewed. A surplus of \$109 will be split with AIPG.

Election of Officers — It was noted that ballots were going out now.

Membership Renewal — It was noted that the membership renewal mailing was also going out now.

Well Construction Area Designated for Wells in Portions of St. Paul Park and Newport, Washington County, Minnesota

The Minnesota Department of Health (MDH) has designated a Special Well Construction Area which includes portions of the cities of St. Paul Park and Newport, In Washington County, as shown on the accompanying map. The Special Well Construction Area designation will remain in effect until further notice.

Groundwater in portions of the designated area has been contaminated at several industrial sites. Several groundwater contaminant plumes have spread to the west and south-west toward the Mississippi River. Groundwater contaminants include petroleum products, several volatile organic chemicals (VOCs), and pentachlorophenol (PCP).

Much of the contamination has been found in the Prairie du Chien bedrock formation. The top of the bedrock is found at, or within several feet of the ground surface in most of the area. There has been only limited groundwater monitoring in the underlying Jordan sandstone formation, which has indicated the presence of PCP and VOCs at concentrations below the current health risk limits (HRLs). No monitoring has been done in the formations below the Jordan sandstone.

Extensive remedial measures have been implemented. These remedial measures are expected to be effective, but it will be many years before the groundwater is fully protected. The MDH and the MPCA are concerned about the public health effects that could result from the use of water-supply wells in the contaminated aquifers prior to the cleanup completion. Construction of new wells or modification of existing wells within the Special Well Construction Area may interfere with cleanup efforts, or may cause further spread of the contamination. It is important to assure that unused wells are properly sealed.

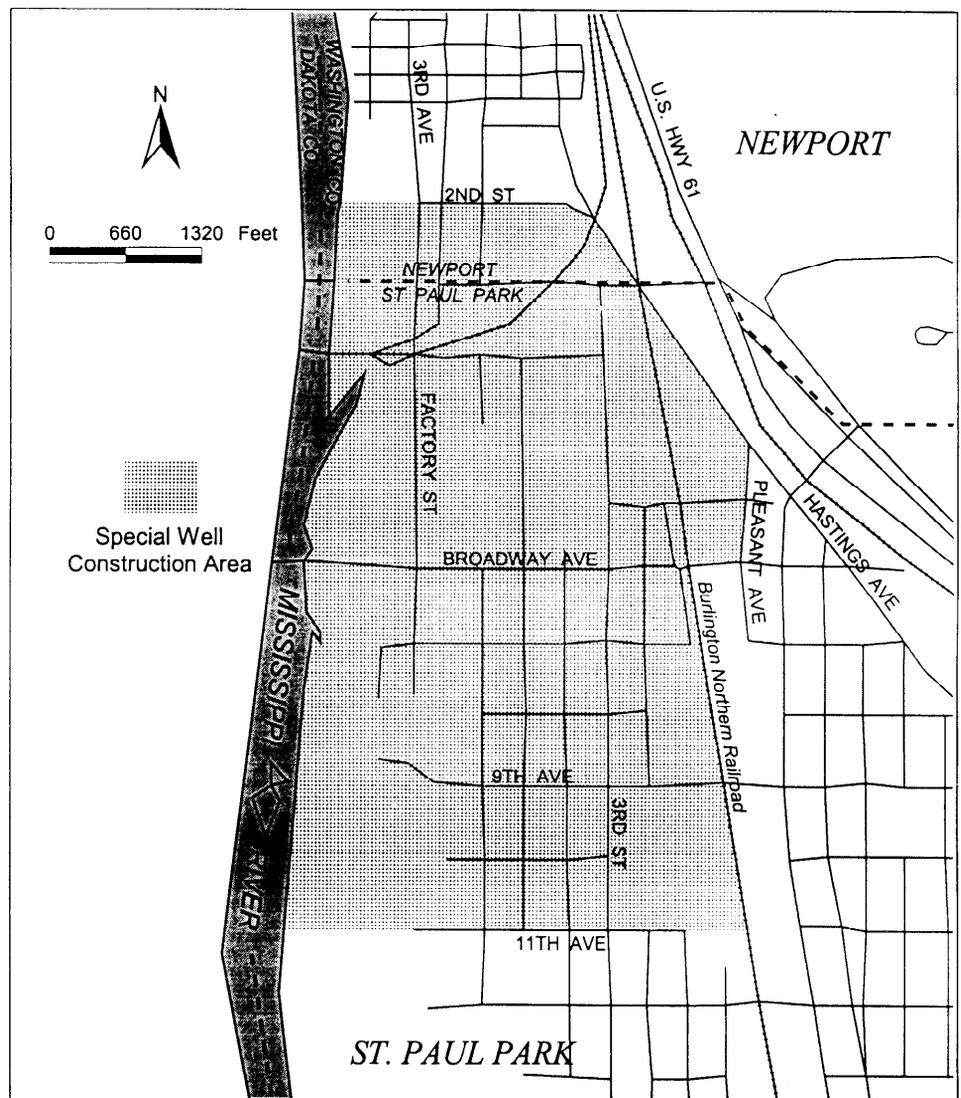
Within the designated area, wells may not be constructed, modified,

or sealed until after the MDH has reviewed and approved plans for the proposed activity. Plans are required for all regulated wells, monitoring wells, and dewatering wells. In reviewing plans for well construction or modification, the MDH will consider the proposed well construction details, use, and pumping rate, as well as available knowledge of groundwater contamination and movement near the well site. Special requirements may include completion of the well in or below the Franconia formation, with casing and grout emplaced through all overlying formations. The well may need to be sampled for VOCs and/or PCP to determine if

the water supply is acceptable. Well construction or reconstruction will not be approved if the MDH, in consultation with the MPCA, concludes that the proposed construction or reconstruction may interfere with cleanup efforts, cause further spread of contamination, or result in human exposure to contaminants at concentrations exceeding the MDH Health Risk Limits (HRLs).

For additional information regarding the Special Well Construction Area, or to request a copy of the Special Well Construction Area Designation, contact Ed Schneider at the MDH at (612)215-0827.

Special Well Construction Area St. Paul Park and Newport



Minnesota Department of Health
Well Management Unit

November 10, 1997
sppadv31.apr

MGWA Minutes, cont.

Newsletter/Directory Update —

Tom Clark noted that the newsletter was currently at the mailing house. Copy deadline for the next newsletter is mid-February.

Advertising — Leigh said she would check in January with companies not currently advertising and those with expired ad orders.

Web Page — Sean reported that he had registered MGWA.ORG as the MGWA web site and had signed up the service. A skeleton home page is set up, but not all items are active. Tom asked about electronic registration, but Sean noted it would not be likely, at least in the near-term. Sean noted that the site included e-mail and could be used for general information (FAQ's) and comments to the Board. Past newsletter issues will be available as .pdf files. Sean noted the need for lists of links — both to and from. Webmasters at other sites will need to be notified and invited to include MGWA links at their site. Other items to post at the site included future meetings, meeting minutes, bylaws and officers. Ray said he had a ground water glossary he could contribute. Jan suggested a meeting in a month or two to discuss design and content for those inter-

ested in construction and maintenance of the page.

Spring Meeting — Ray said a joint meeting with Wisconsin will not work out. We will hold a meeting on our own. Topics suggested included naturally occurring contaminants, risk-based cleanup goals vs. non-degradation cleanup policy, urban contaminants, brownfield redevelopment, Twin Cities water supply development (long-term water supplies, distribution, conjunctive use). It was suggested that the program be scheduled so that it does not conflict with Water '98 (first week in May) in terms of scheduling and content. Leigh asked if Ray had contacted Ken Haberman regarding contacting financial and real estate sources in karst areas. She also asked if the spring meeting could be done with the MN Environmental Initiative and MN Planning Assoc., as was done several years ago. Gretchen said she would look up contacts.

Legislative Open House — The question was brought up whether to do another legislative open house. Discussion to be continued.

Educational Activities — Leigh suggested the Board consider other activities such as for Earth Day. She noted that the Mall of America usually has educational displays. A special project could be construction of

a geologic column using rock samples.

AIPG Educational Activities — Paul Bulger provided an update of educational activities sponsored by AIPG, including educational materials, programs and coordination with teacher groups.

Newsletter/Directory Update — Tom Clark indicated the September newsletter was ready to print and would be mailed next week.

Election of Officers — Nominations are needed for president-elect and secretary. Jan said that she would run for another term as secretary. Ray encouraged Board members to make personal calls or other contacts with potential Board candidates. Paula suggested making an announcement on the bus at the beginning of the field trip. It was noted that the ballot needed to be inserted in the December newsletter. Gretchen drafted a brief "want ad" for open positions for the September newsletter.

Spring 98 Meeting — A joint spring meeting with the Wisconsin Chapter AWRA was discussed. It was noted that the MN chapter of AWRA has been inactive.

Meeting adjourned 9:00 a.m.

— *continued on next page*

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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 1998. Annual dues are \$20 for professional members and \$15 for students. Members are entitled to purchase the annual membership directory for \$7. Additional donations toward our scholarships and/or the use of recycled paper will be gratefully accepted.

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MGWA Minutes, cont.

January 8, 1998, Egg & I, University and 280, 7:30 a.m.

Attending: Ray Wuolo, President; Paula Berger, President-Elect; Paul Bulger, Treasurer; Jan Falteisek, Secretary; Tom Clark, newsletter editor; Leigh Harrod, advertising; Jennie Leete, Sean Hunt, WRI.

Approval of Minutes — Ray Wuolo called the meeting to order at 7:45 a.m. Minutes for December were approved with the changes.

Election Results — A tie for President-Elect and no contest for Secretary. According to the By-Laws, the Board votes to resolve ties. Ray suggested that one person act as President-Elect and the other as Field Trip Coordinator (MGWA leads the 1998 trip). The first Board vote was a tie. The second Board vote resulted in Jim Piegat for President-Elect and offering the Field Trip Coordinatorship to Bob Beltrame. Paula will contact both with the results. In a related discussion, possible By-Laws changes were discussed, including adding others to the Board. Jennie suggested contacting past presidents to serve as a By-Laws revision committee. Resolved changes could be voted on at the Spring Meeting.

Spring Meeting — Possible dates were discussed and Friday April 17th was chosen. Topics were again considered and "brownfield redevelopment and ground water protection" was of most interest. It was suggested the spring meeting include a morning session, box lunch, and membership annual meeting (see comment on by-laws changes above). Places to hold the meeting were discussed, including the MPCA Board Room and MN History Center. Jennie said she would check if the MnHC had appropriate facilities available. Presenters: Tom Clark said he would check with Joe Otte. Others would be Ken Haberman (contact by Ray Wuolo), attorneys, lenders, developers. Jan said the MDH had already called her suggesting a presentation on the topic.

1997 Financial Summary — Paul Bulger reviewed the financial summary prepared by WRI.

Scholarship Requests — Paula reported that she had received three scholarship requests: Carlton, Macalester, and Bemidji State. The Board voted to provide a \$300 scholarship to each.

WRI Contract for 1998 — Jeanette Leete presented a 1998 contract for WRI services and noted changes compared to the expired 1997 contract.

Newsletter/Directory Update — Tom Clark noted that pictures of new officers will be needed for the next newsletter. Copy deadline for the next newsletter is mid-February.

Web Page — A web page subcommittee of Sean, Jan, and Paula will meet January 21st at DNR to work on development of the web page.

Next meeting — February 5, 1998, 7:30 a.m. at Egg & I.

Meeting adjourned 9:45 a.m.

February 5, 1998, Egg & I, University and 280, 7:30 a.m.

Attending: Ray Wuolo, Past President; Paula Berger, President; Jim Piegat, President Elect; Jan Falteisek, Secretary; Leigh Harrod, advertising; Jennie Leete, Sean Hunt, WRI; Greg Brick, guest.

Approval of Minutes — Paula Berger called the meeting to order at 7:45 a.m. Minutes for January were approved.

Board Introduction — Paula welcomed President Elect James Piegat to the Board. Paula asked each Board member and others attending to introduce themselves.

By-Laws Revisions — Paula discussed possible changes to the Board; clearer recognition of the past president as a voting member, and voting privileges of support volunteers and staff (i.e., WRI). Ray noted that if support volunteers are given voting privileges, the number of elected Board positions should remain in the majority. Jennie will forward some general guidance regarding organization By-Laws to Paula. Paula also noted that a resolution was needed to allow WRI to sign checks. By-Laws were last changed in 1994 in anticipation of tax status change.

Spring Conference/Meeting April 17th

— Paula confirmed the spring conference on Brownfields to be April 17th. Jennie and Sean reported on the Minnesota History Center as a potential site. A cost list was distributed. It was noted that costs were comparable to meetings in the past. WRI was directed to reserve the auditorium for April 17th. Notices and invitations should briefly mention that the MGWA annual meeting will be held immediately after. Jim suggested Pat O'Connor, head of tax payer services, Hennepin County, as a local government speaker for the conference. Jim noted that Pat was involved in a "Brownfields initiative" for the county. Jim said he would contact him. Paula noted that by the next Board meeting the conference agenda needed to be set and a flyer developed, including a definition of "brownfields" and its importance to ground water. Jennie noted that March 1st the speakers need to be lined up so a mailing can be done. Also by April 2 the estimated number of attendees will be needed. Paula said she would contact Lisa Poghoff of MDH regarding a joint presentation with PCA staff.

Field Trip Coordinator — Paula noted that Bob Beltrame declined to be field trip coordinator for this year. An ad for field trip coordinator will be in the next newsletter.

SESOIL — Ray noted he had been initially contacted by the developers of the SESOIL program to discuss the MGWA potentially co-sponsoring a training program. Ray said that what they really wanted was the MGWA mailing list. Ray said he would tell them that a one-time-use list was available for \$125.

COLOG — Jim had been contacted regarding a slug testing technique using distilled water.

Newsletter/Directory Update — Jan said that the newsletter team would be meeting the following week and that materials were coming together.

Next meeting — March 5, 1998, 7:30 a.m. at Egg & I.

Meeting adjourned 8:45 a.m.

Respectfully submitted, Jan Falteisek, MGWA Secretary

**MDH WELL CONFERENCE
MARCH 25, 1998
AGENDA (TENTATIVE)**

8:00 a.m.

Registration, Continental Breakfast

**PLENARY SESSION
(Moderator: Dan Wilson, MDH)**

- 8:25 Welcome Dan Wilson, MDH
- 8:30 MDH Well Management Section Update Mike Convery, MDH
- 8:45 MDH Field Experiences and Case Histories Well Management Field Staff
- 9:30 Frog Deformities and Water Quality in Minnesota Hillary Carpenter, MDH
- 10:00 BREAK
- 10:15 MDA/MDH Nitrate Clinics Jennifer Gallus, MDA
- 10:45 Groundwater Resources Exploration in SW Minnesota Jim Berg, DNR
- 11:30 USGS Nat'l Water Quality Assessment Program
Red River Valley & Otter Tail Co. Tim Cowdery, USGS

- 12:00 LUNCH

AFTERNOON CONCURRENT SESSIONS

**1. FULL AND LIMITED WELL CONTRACTORS
(Moderator: Peter Zimmerman, MDH)**

- 1:00 Surface Water Systems Anita Anderson, MDH
- 1:30 Dealing With the Red Manace--Iron Treatment Chuck Fitzgerald, Wisconsin DNR
- 2:15 BREAK
- 2:30 Forum on Well Sealing, Disclosures, and the Role of ,
the Well Contractor Ronald Thompson, MDH
William Salverda, Salverda Well Co.
Gregory Anderson, The Water Connection
- 3:15 PVC Couplings, other materials issues Ed Schneider, MDH
- 3:45 ADJOURN

**2. ENVIRONMENTAL CONTRACTORS
(Moderator: Mark Malmanger, MDH)**

- 1:00 Results of the USGS National Water Quality Assessment Program
Upper Mississippi River Basin Jim Stark, USGS
- 1:30 Oxygen Release Compound (ORC) Scott Wilson, Regenesis
- 2:15 BREAK
- 2:30 Use of Radio Frequency Heating for In-Situ Remediation Mark Johnson, Dahl & Assoc.
- 3:15 Geoscientist Licensure Michael Convery, MDH
- 3:45 ADJOURN

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Please circle which session you are planning on attending in the afternoon. 1 - 2

Fee (\$50) Enclosed Will pay at the door (\$60) Check/Money Order No. _____ Cash

Please mail by March 15, 1998, to: Minnesota Department of Health, Well Management Unit, P.O. 64975, St. Paul, Minnesota 55164-0975. You may call 612/215-0811 or fax (612/215-0978) your late registration, but you must pay \$60 at the door. If more than one person registers, use a copy of this form.

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March 1998

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 - c) comparison of concentrations with drinking water criteria
 - d) geochemical and risk analysis of each parameter
- 2) Tables providing
 - a) mean, median, minimum, maximum, 95th percentile and 95th upper confidence limit concentrations for 52 inorganic parameters in each principal aquifer
 - b) information on factors affecting distribution of sampled chemicals
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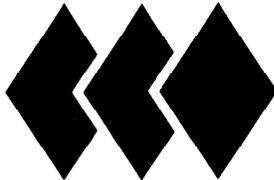
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