

Minnesota Ground Water Association

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Mass Appraisal of Contaminated Properties

by J. Scott Renne, MAI,
Washington County Assessor

Minnesota's property tax system, like almost all others in the country, is based upon the value of the real estate. An assessor's job is to assign values to the real estate to provide a basis for the distribution of the tax burden. A difficult job under the best of circumstances, appraisal is greatly complicated when an unusual situation such as contamination of properties develops.

As the Washington County Assessor, I recently faced such a situation in Lakeland and Lakeland Shores, two cities in the St. Croix River Valley that discovered contaminated wells in 1987.

The appraisal process is a systematic way of problem-solving. It consists of:

- problem definition
- collection and analysis of general data affecting value
- collection and analysis of specific data affecting value
- application of the cost approach
- application of the market approach
- application of the income approach
- reconciliation and final value estimate

Mass appraisal extends this process into a more detailed statistical analysis and application to a large number of properties. For Minnesota, all taxable property is revalued each year on the assessment date, January 2nd. The appraisal process can deal with unusual valuation issues such as a contaminated property.

The appraiser can research sales of similar properties and apply that information to the subject

property. Another method is to estimate the cost to cure the problem and subtract that from the valuation of the property if the problem did not exist. Unfortunately, in many cases of contaminated property no similar contaminated property has been sold, nor is there a definite cost to cure the problem. This was the situation in Lakeland and Lakeland Shores.

To attempt to value the contaminated properties in these areas, the first step was to collect as much data as possible regarding the problem. Interviews were held with:

- City officials
- PCA officials
- Washington County Public Health Officials
- real estate agents active in the area
- other real estate professionals
- Assessors who have had experience with properties that have had contaminated wells

Interviews with the individuals experienced in environmental health were to determine the nature and extent of the problem, a solution to the problem, and costs associated with solving the problem. Because these individuals were in the initial stages of establishing alternatives, there was no consensus about solutions or about costs.

Real estate professionals were interviewed to determine how a contaminated well affects the marketability of a property. Generally this question had to be posed from a theoretical standpoint because most people have had limited experience in actually trying to value or sell a home with a contaminated well. Understandably, there was no consensus of opinion resulting from these interviews.

Part of the problem is that each situation proves to be unique. In Lakeland and Lakeland Shores there were three levels of contamination. These were:

- 81 properties with levels of water contamination severe enough to require the use of bottled water
- 90 properties had trace levels of contamination that were under the threshold to require bottled water
- 365 properties were in an area determined to have a high potential risk of contamination. This area was called the well advisory area which required Minnesota Department of Health approval prior to drilling new wells or making changes to existing wells.

The Assessor's Office decided to treat each of the three classes of contamination differently. Although this problem was discovered in the spring of 1987, the January 2, 1988 assessment was the first to try to estimate these values. We did not have enough sales information to accurately measure the changes in values even though we delayed until the last possible stage in the assessment cycle before we made conclusions about values. Generally speaking, the mass appraisal schedules for all areas are developed in the fall for the January

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2nd assessment. Because of the unusual circumstances, the schedules for Lakeland and Lakeland Shores were developed in March to obtain as much sales information as possible.

The factors which affected the marketability of the properties were:

Financing

The ability to finance a real estate transaction is essential in maintaining stable or increasing values. New financing typically requires a test of well water quality. Most lenders stated that underwriting policies would not allow them to finance a property that had a bad well. This would limit the types of available financing to an assumption of existing financing, contract for deed, or cash. These transactions are the least popular of financing methods for residential real estate. Assumptions are about 15% of all transactions, contract for deeds about 10%, cash 3% to 5%.

Publicity

There were several newspaper articles and television reports about

the problem. These would serve to create a negative stigma toward the area, whether it is deserved or not. Many buyers who might be considering buying a home in this area might reevaluate their plans based on such publicity.

Uncertainty

With some contaminated well problems, the source of contamination may be held liable for correction costs. If the source is the government or a major corporation, there usually is no significant cost to the homeowner. In this case, even if it becomes possible to assign the responsibility for the contamination to given parties, it is not certain that they could pay for correction of the problem.

All of my research failed to yield a specific conclusion. As with many appraisal assignments, the experience, judgement and intuitive sense of the appraiser must be applied to reach a final estimate. The following valuation reductions were established for the January 2, 1988 assessment:

- \$19,000 for the properties using bottled water

- \$12,000 for properties with trace levels in well water
- \$3,000 for properties in the well advisory area

Many residents strongly protested these valuation changes. They felt that by dropping values, even though their taxes would be reduced, the problem was legitimized and the negative stigma was perpetuated.

City officials are concerned with the decline in tax base. The total reduction in market value was \$3,714,000. This resulted in an approximate 1.8 mill increase in the local mill rate. The amount of tax reduction experienced by affected properties has to be picked up by all other properties.

As the January 2, 1989 valuation approaches, the Assessor's Office is closely monitoring sales activity in these areas. In addition, there are other areas in Washington County that have had less severe well contamination problems. It is a continual challenge to recognize and measure the effect that these problems may have on property values.

Certification Opportunities

The **Association of Ground Water Scientists and Engineers** (AGWSE, a division of the National Water Well Association) provides certification as a certified ground water professional (CGWP). Professionals who possess a baccalaureate degree can apply for certified ground water professional status if they have at least seven years of progressively more responsible ground water experience. Advanced degrees, if in the field of ground water, may count up to three years of the required seven years of ground water work experience. Applications may be requested by writing NWWA, CGWP Certification, 6375 Riverside Drive., Dublin, OH 43017

The **American Institute of Professional Geologists** (AIPG) recognizes that a geologist can work in environmental geology, hydrology, or hydrogeology, and that specialization and further study is common for geologists. Members of AIPG (Certified Professional Geologists) have graduated from an accredited university with a major in geology or geological engineering, have a minimum of 36 semester credits of course work in geology, have a minimum of five years of postbaccalaureate experience in the practice of geology and have a sustained record of professional and ethical conduct. A peer review process is used to verify credentials of applicants. For further information, contact AIPG, 7828 Vance Drive, Suite 103, Arvada, Colorado

The **American Institute of Hydrology** (AIH) provides certification patterned after the professional engineering registrations. This process requires all credentials of applicants to be thoroughly scrutinized and requires that individuals meet specific educational requirements, demonstrate substantive professional work experience, including evidence of original investigations, have five letters of reference submitted from working professionals, and then pass a written examination. For more information, contact Helen Klose, AIH, 3416 University Avenue SE, Suite 200, Minneapolis, MN 55414

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Water and Wetland Regulation by the St. Paul District U.S. Army Corps of Engineers

Navigable waters of the United States (Section 10 permits). Under Section 10 of the River and Harbor Act you need a permit from the Corps before putting any structure, or doing any other work, in a navigable water of the United States.

Navigable waters within the St. Paul District include the larger rivers, the Great Lakes, other waters bordering Canada, and some tributary lakes and streams. The St. Paul District is responsible for administering the permit program within the States of Minnesota and Wisconsin.

Other waters of the United States (Section 404 Permits).

The regulatory jurisdiction encompasses all waters of the United States which include wetlands. Under Section 404 of the Clean Water Act, filling, dredged material disposal, side-casting during drainage projects, or other filling activities in lakes, streams and wetlands come within that jurisdiction. (Work that does not involve filling or a discharge of dredged material needs a permit only if it is done in a navigable water.)

Wetlands

Regulated wetlands do not always have standing water and cattails, but can be meadows or woods that are only seasonally flooded.

Call the Corps if you plan any activities in waters or wetlands. Send the St. Paul District a request for a permit determination, with a brief description of the proposed work and location. (Maps and photos, too, if possible.) Pre-application conferences are encouraged, especially on larger projects. If the work will have minimal environmental consequences, it may be eligible for a shortened form of processing.

If you see what may be a violation, please contact the Corps' Surveillance and Enforcement Section. The phone number is (612) 725-7976.

Calendar

October 24 - 25, 1988

Agrichemicals and Ground Water Protection: Resources and Strategies for State and Local Management. Contact Linda Schroeder, Freshwater Foundation, 2500 Shadywood Road, Box 90, Navarre, MN 55392.

November 6 - 11, 1988

24th AWRA Conference and Symposia, Water for the Years Ahead - Quality and Quantity: 1990 and Beyond, to be held in Milwaukee, Wisconsin. Contact Dr. Earl Spangenberg, College of Natural Resources, University of Wisconsin - Stevens Point, WI 54481.

November 9 - 10, 1988

21st Annual Water Resources Conference, to be held by the Minnesota Section of ASCE. Contact Lori Graven, University of Minnesota, 315 Pillsbury Dr. SE, Minneapolis, Minnesota 55455.

November 9 - 11, 1988

Petroleum Hydrocarbons and Organic Chemicals in Ground Water, to be held in Houston, Texas by NWWA.

November 14 - 16, 1988

Practical Karst Hydrogeology, with Emphasis on Ground Water Monitoring, to be held in Nashville, Tennessee by NWWA.

November 16 - 18, 1988

Second Conference on Environmental Problems in Karst Terranes and Their Solutions, to be held in Nashville, Tennessee by NWWA.

November 29 - 30, 1988

Leak Detection Methods for Underground Storage Tanks, an EPA Seminar to be held in Rosemont, Illinois. Contact Ursula S. Thomas at JACA Corp, Fort Washington, Pennsylvania (215) 643-5466.

December 5 - 9, 1988

Safety at Hazardous Materials Sites: A Hands-on Workshop, to be held in Orlando, Florida at the Mid-Florida Tech Training Academy. To be repeated January 30 - February 3,

1989. Sponsored by USGS and NWWA.

January 9 - 11, 1989

Fundamentals of Ground Water and Well Technology, to be held in Columbus, Ohio by NWWA. To be repeated November 6 - 8, 1989.

January 12 - 13, 1989

Applied Drilling Engineering for Rotary and Auger Methods (for ground water-related investigations, to be held in Columbus, Ohio by NWWA. To be repeated November 9 - 10, 1989.

January 30 - February 3, 1989

Management of Hazardous Materials and Hazardous Wastes, to be held in Findlay, Ohio by NWWA.

March 20 - 23, 1989

New Field Techniques for Quantifying the Physical and Chemical Properties of Heterogeneous Aquifers, to be held in Dallas, Texas by WRRU, Auburn University, Alabama, 36849-5124.

May 10-19, 1989

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

November 12 - 17, 1989

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

For information about meetings and seminars to be held by the NWWA, contact NWWA at 6375 Riverside Drive, Dublin, Ohio 43017 (614) 761-1711, Telex 241302.

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

President's Page

by Linda Lehman

Minnesota is currently releasing two of their water protection strategies, the Ground Water Protection Strategy and the Water Resources Strategy for the Control of Pests and Management of Nutrients.

rinsed containers. Contamination may also result from normal pesticide use. Nitrogen contamination can result from many sources, including fertilizer usage, animal wastes and malfunctioning septic systems.

In developing the state strategy for the protection of water resources from contamination by pesticides and nutrients, options to address the above policy directions

and protection. The Strategy is built on the strong regulatory framework which the State has established. State agencies already have statutory authority to establish ground water standards and regulate pollution sources, to protect and monitor drinking water supplies, to regulate water appropriation, and to regulate the sale and use of agricultural chemicals which may impact ground water quality.

Minnesota Water Protection Strategies

Ground Water Protection Strategy	Water Resources Strategy for the Control of Pests and Management of Materials	Non-Point Source Pollution Strategy	Other Strategies
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As President of MGWA, I had occasion to participate in the EQB's Advisory Committee on these two strategies. I wish to generally discuss some of my perceptions regarding the strategies. I will not attempt to go into any detail on these strategies since, hopefully, future editions of this newsletter will contain more complete summaries. The following discussions have been excerpted directly from the Strategies:

Water Resources Strategy for the Control of Pests and the Management of Nutrients

Manufactured fertilizers and pesticides have been increasingly used for the past twenty years in many different areas, including farmlands, forests, lawns, and recreational areas. Nationally, pesticides are estimated to be used today at a rate triple the amount used in 1964, with agricultural uses accounting for 79 percent of all uses.

Water resources can become contaminated at any point in the life cycle of a pesticide, including manufacturing, distribution, storage, use and disposal. Contamination can result from spills and leaks at manufacturing or bulk storage and handling facilities, from mishandling during application, and from improper disposal of un-

were identified. These options have been structured around five initiatives. The five initiatives are:

- To protect ground and surface water from contamination with pesticides and nutrients through enhancement of regulatory efforts, prevention planning, and corrective actions.
- To provide the public with necessary information, education, and incentives in order to foster wise, responsible and reduced usage of pesticides and supplemental nutrients.
- To better coordinate state, federal and local responsibilities and programs in order to better meet protection/prevention goals.
- To enhance the current body of knowledge of pesticide and nutrient contamination problems, prevention practices and alternative management approaches.
- To identify possible funding mechanisms to ensure that the above recommendations are implemented.

Minnesota Ground Water Protection Strategy

This strategy will serve as the blueprint for future ground water management activities at the State level, and also help define the local role in ground water management

These water related functions are coordinated through the Water Resources Committee of the EQB, a board composed of the top executive officers of the major environmental agencies together with citizen members.

The Strategy has been structured around four major initiatives:

- To protect ground water quality now and for the future, to ensure safe drinking water supplies, and to prevent ground water contamination by effectively regulating sources of pollution.
- To ensure adequate water supplies, to regulate water appropriation and use for protection of highest priority users, and to improve coordination of quality and quantity aspects of regulatory programs.
- To enhance the current body of knowledge on Minnesota's ground water resource, delineating problem areas and providing information needed to effectively manage the resource.
- To provide public, decision-makers, regulators, and the regulated community with the necessary information and education for making environmentally-sound decisions in areas which may impact ground water.

These initiatives depend upon substantially increased funding for

ground-water protection and management. Success also depends on stability in funding levels to maintain continuity.

These two strategies provide us with clear goals. We now need to look at how they will be implemented.

I believe two additional things are required:

1. Legislative summaries
2. Implementation plans

Legislative Summaries

The legislative summaries need to focus on the big picture so that they understand this is not a piecemeal approach. It is difficult to see the big picture when you get bogged down in the details of such things as defining laboratory certification standards or how to do health risk assessments. Legislators are some of the busiest people I know. While it is important to have detailed information available for those who wish to examine it, concisely written goals and steps to achieving them must be presented to the legislators.

Implementation Plans

To be meaningful, the strategies require increased coordination between state agencies and the public. While it sounds simple, it may be the most difficult part of the strategy to achieve. This problem is not unique to Minnesota but plagues most large bureaucratic agencies. Coordination will not happen by itself. IT MUST BE WELL PLANNED. Simply throwing money and manpower at the problem will not necessarily solve it. I would encourage all the state agencies to think about how they would implement the strategies, and especially the coordinative effort. We need to be able to work smarter and more efficiently if we are to implement the strategies within realistic cost bounds. A difficult task yes, but I put forth the challenge.

In summary, the strategies provide us with goals. We must now market these strategies to the legislature and then we must responsibly manage our efforts to implement them.

USGS Report Describes Minnesota Ground Water Quality

The overall quality of Minnesota's ground water is good, and most water supplies meet drinking-water standards with little treatment, according to a report issued by the U.S. Geological Survey.

The USGS report includes information of the water quality of principal aquifers, effects of land use on water quality, and the potential for water-quality changes in Minnesota. Illustrations show the principal aquifers and related water-quality data, the location of selected waste sites, and ground-water quality information.

Because of the public interest in ground water, this information is being released in advance of its publication in a forthcoming National Water Summary report, which is the fourth in a series of reports that describe the water resources of the United States and its territories.

Ground water now supplies more than half the nation's drinking water, and the volume of water stored in aquifers is 35 times larger than the total annual runoff of streams and rivers. Because of the growing importance of ground water, Federal agencies now spend a total of about \$215 Million annually on ground-water research and investigations, some of which are carried out in cooperation with State and local agencies and universities.

Some selected Minnesota ground-water facts taken from the report:

- Nearly one-half the population of Minnesota depends on wells for drinking water.
- Minnesota's ground water generally is satisfactory for domestic, public, and industrial supplies and for irrigation.
- Naturally occurring saline water is common along Minnesota's western border, the northern shore of Lake Superior, and below depths of about 1,000 feet in the southeastern part of the State.

- Major sources of ground-water contamination in Minnesota are (1) spills or improper disposal of industrial or manufacturing chemicals, (2) leachate from solid-waste landfills, (3) spills and leaks from petroleum-product storage areas and pipelines, and (4) feedlots and agricultural chemicals.

Copies of the 8-page report, *Minnesota Ground-Water Quality*, released as USGS Open-File Report 87-0743 are available for inspection at the Minnesota District Office, USGS, Room 702, Post Office Building, 180 E. Kellogg Blvd., St. Paul, MN. Copies may be purchased from Books and Open-File Reports, USGS, Federal Center Box 25424, Denver, CO.

Farm Chemicals in Ground Water: Strategies for Nonprofits

Case studies of five statewide organizations that are successfully confronting the problem of ground water contamination by agricultural chemicals are included in a new publication by the Minnesota Project. *Farm Chemicals in Ground Water: Strategies for Nonprofits* is available for \$8.00 from Loni Kemp, the Minnesota Project, Southeast Office, Box 4, Preston, Minnesota 55965.

The report covers an in-depth look at each group's mission, funding, leadership, relationships to other groups, focus on ground water issues, methods, measures of success, weaknesses, and future plans. The organizations studied are California Institute for Rural Studies and California Action Network; Center for Rural Affairs; Iowa Natural Heritage Foundation; Practical Farmers of Iowa; and Texas Center for Policy Studies.

Key observations and recommendations are summarized with an analysis of the unique policy opportunities and barriers posed by the issue of ground water contamination by farm pesticides and fertilizers.

Are There Chemical Hazards in Your Job?

The Occupational Safety and Health Administration (OSHA) expanded its Hazard Communication Standard to cover all industries where employees are exposed to hazardous chemicals not just the manufacturing sector. The revised rule required the non-manufacturing sector of industry to be in compliance with the standard's provisions by May 23, 1988. The U.S. Court of Appeals, however, has stayed the rule for construction employers in the non-manufacturing sector.

Because of confusion that resulted from the court stay, OSHA published a notice in the July 22, 1988 *Federal Register* clarifying the situation. The notice stated that for non-manufacturing industries employers, other than construction, the Hazard Communication Standard is in effect. OSHA also warned that beginning August 1, 1988, they will check for compliance with the rules in all programmed inspections in covered non-manufacturing industries.

The Hazard Communication Standard requires employers to:

- develop written hazard communication programs specific to the chemical hazards present in their workplaces
- implement training programs
- ensure that all containers of hazardous chemicals are properly labeled
- keep and maintain material safety data sheets on all hazardous chemicals purchased and used.

Those not in the construction industry should immediately obtain a copy of the rules and comply with their requirements. Contact your local OSHA Office or the National Water Well Association for a copy of the rules.

Construction-industry employers may want to gather material safety data sheets, identify the hazardous chemicals in their workplace, and begin drafting a written hazard communication

program. It is anticipated that OSHA's Hazard Communication Standard in some form will eventually extend to them.

Emergency Planning and Community Right-To-Know

Expansion of OSHA's Hazard Communication Standard may bring you under the Community Right-To-Know provision of Emergency Planning and Community Right-To-Know Act of 1986.

U.S. EPA's rules require facilities that must maintain material safety data sheets (MSDS) under OSHA regulations to submit copies of the MSDS's or a list of the MSDS chemicals to their local fire departments and state and local emergency planning committees.

An exemption from reporting is provided for chemicals stored below certain threshold quantities. EPA has identified 366 extremely hazardous chemicals. For these, threshold quantities vary from 500 down to just a few pounds. For all other hazardous chemicals, the threshold quantity is 10,000 pound before October 17, 1989 and zero pounds after October 17, 1989. (The zero pounds threshold will be revised pending further study.)

Facilities coming under the expanded OSHA Hazard Communication Standard have until September 23, 1988 to comply.

Submission of an emergency and hazardous chemical inventory form to the local and state emergency planning committees and the local fire departments may also be required. Hazardous chemicals covered are those for which facilities must maintain a MSDS under OSHA's Hazard Communication Standard and which were present at the facility at any time during the previous calendar year. Inventory forms for 1988 must be filed by March 1, 1989. Threshold quantity levels below which an inventory form need not be submitted are:

For extremely hazardous substances: 500 pounds or the threshold planning quantity whichever is lower.

For all other hazardous chemicals: January to December 1988: 10,000 pounds; January to Decem-

ber 1989: zero pounds. (The zero pounds threshold will be revised pending further study.)

Contact your state commission for copies of the inventory forms or the list of extremely hazardous substances.

The list of extremely hazardous substances may also be obtained by writing:

Emergency Planning and
Community Right-To-Know
Service (OS-120)
401 M Street SW
Washington, D.C. 20460

EPA has also established a hotline to answer specific questions regarding the Emergency Planning and Community Right-To-Know Act. The toll-free hotline number is (800) 535-0202

Radon Facts and Abandoned Wells Brochures

Two new brochures are available from the Environmental Health Division of the Minnesota Department of Health.

- **Radon Facts** explains what radon is, how it gets into dwellings, how to test for it and how to protect homes against radon.
- **Abandoned Wells: Protecting Ground Water is Everybody's Business** explains why abandoned wells are a problem, what causes a well to become unusable and abandoned, what to do if a landowner finds an abandoned well, and how and why abandoned wells should be sealed.

Both of the brochures can be obtained from:

Minnesota Department of Health
Division of Environmental Health
717 Delaware St. Southeast
P.O. Box 9441
Minneapolis, MN 55440

SWIM Meeting Highlights

SWIM (Systems for Water Information Management) is an inter-agency-communication committee coordinated by the State Planning Agency (SPA). The purpose of its meetings are the sharing of water-resource information, avoiding duplication of activities, and pursuing effective resource management through separate but coordinated computer systems (linked through consistent standards and identifiers).

On August 14, 1988, a meeting of SWIM's ground-water subcommittee was held at the Land Management Information Center (LMIC), SPA's central information clearinghouse. All interested State and Federal agencies were represented. Increased University of Minnesota participation is being actively solicited. The purpose of the meeting was to develop a funding proposal for legislation relating to ground-water-data automation and integration. This proposal will be incorporated into the Omnibus Ground Water Bill being drafted as a result of the new Ground Water Protection Strategy.

The first business addressed was the coordination of paperwork for various agency components of the funding proposal. Staffing is being requested by the Minnesota Department of Health (MDH) for collection and automation of abandoned well data. MDH is also worried about processing data on the estimated 33,000 new monitoring wells to go in at gas stations, etc. when next year's programs go into effect. Historical nitrate and bacteria data at MDH should also be automated.

Plans at the Minnesota Pollution Control Agency (MPCA) are to proceed with automation of their historical water-quality data. Funding is being sought to enter this and other data and to maintain their data-base system *IGWIS*. Although *IGWIS* has the framework to handle ground-water quality data for all State agencies, its finite storage capacity requires continuance of

the less-detailed County Well Index water-quality file at the Minnesota Geological Survey (MGS). The goal of several agencies, to initiate a Point Source Locational Inventory, will be coordinated by MPCA and MGS.

The Minnesota Department of Agriculture does not intend to automate its relatively small inventory of water-quality data at this time. However, there may be future efforts in the Food Division for dairy farms or bottled water.

The Minnesota Department of Natural Resources (DNR) and MGS are seeking funding to update the STATE WELL INDEX (also known as WELLS), the keystone of the state ground water data system. Flags and cross references (still in development) link this data base to many related systems, even at other agencies. Because of its importance to planned monitoring program coordination, it is possible that funding may be sought to move the STATE WELL INDEX to LMIC. It is currently housed at the U.S. Geological Survey (USGS) for DNR cost and access efficiency.

The MGS is also seeking funding to give statewide coverage to its WELL LOG data base which contains detailed stratigraphy. They also wish to develop and promote their COUNTY WELL INDEX program, which allows user-friendly entry of well and water-quality data by County or local personnel.

The USGS is not a formal part of this funding proposal, but can provide services when requested by the State. Funds would be required to produce land-resource maps for inclusion in the State initiative to evaluate the vulnerability of the ground water to contamination. Another service might be to automate an annual update of its recent inventory of interbasin water transfers and diversions in Minnesota. A draft of a report on *The Automation of Minnesota's Water-Use Data Base* was given to the SWIM coordinator for review. Copies of the recently published report *USGS Ground-water Studies in Minnesota* were distributed to attendees.

The LMIC seeks funding to improve their responsiveness to per-

ceived State needs, independent of funded projects. Ground-water data bases (quality and quantity) need to have an interface between their frameworks at a number of different locations. Funds are needed to automate results from various studies into the State's Geographic Information System (GIS). LMIC is starting a guidance group for GIS layer development by other agencies.

Dollar figures for the above components were discussed but are not yet finalized.

USGS has new District Chief

Bill Herb, Don Albin's replacement as District Chief of the U.S. Geological Survey, will arrive on October 3rd. He was Subdistrict Chief in the Fort Worth, Texas office, and has worked in USGS offices in Maryland and Pennsylvania. He has degrees in Forest Hydrology (MS) and Forest Science (BS) from Penn State University. His experience with the USGS (since 1973) has been mainly in urban hydrology, sedimentation, general hydrology, and hydrology of coal areas.

Take Note

Delta Environmental Consultants, Inc. has moved their St. Paul, Minnesota office. The new address is: Delta Environmental Consultants, Inc. 1801 Highway 8, Suite 114, St. Paul, MN 55112. They can be reached by phone at (612) 636-2427 and by FAX at (612) 636-8552.

Mail to UMD's Natural Resources Research Institute should be addressed as follows: NRI (Dr. Michael J. Lulich, Director), 3151 Miller Trunk Highway, Duluth, MN 55811

Environmental Laws

Condensed from Solid Waste News and Notes, a publication of the Minnesota Pollution Control Agency

The following bills passed this session and became Minnesota Law:

Waste Management Act Amendments (SF 1891 Merriam; HF 2031 Nelson, D.):

- **Yard Waste Ban:** bans yard waste disposal in landfills or resource recovery facilities except for the purposes of composting in the metropolitan area after January 1, 1990 and outside the metropolitan area after January 1, 1992. This saves landfill space, prevents creation of nitrous oxides when yard waste is incinerated; and recognizes composting as the preferred method of waste management for yard wastes.
- **Used Oil:** prohibits disposing of used oil in or on the land unless approved by the MPCA and allows the Waste Management Board to make loans to businesses for purchase of used oil processing equipment and grants to counties for installing public used oil collection tanks. This assures that used oil will not be disposed of on the land.
- **Other Changes:** authorizes the MPCA to recover property transfer investigation, review and oversight costs incurred when assisting persons in determining whether real property has been

the site of a release or threatened release of a hazardous substance; prohibits the sale or giving away to consumers beverage or motor oil containers held together by nondegradable plastic

Environmental Lien (SF 412 Luther; HF 297 Long):

Allows the MPCA to recover State Superfund and State Petroleum Fund monies that have been spent by the MPCA in cleaning up contaminated sites by placing a lien on the property that has been cleaned up. The Environmental Lien is subject to the rights of any person including an owner, holder of a mortgage or security interest or judgement lien creditor whose interest is perfected before an environmental lien notice has been filed. This provides the MPCA with a means of preserving its claim against potentially valuable real property and protects such claims from discharge in bankruptcy.

Environmental Trust Fund (SF 2000 Moe, R.; HF 2182 Munger)

Proposes an Amendment to the Minnesota Constitution to be submitted to the people at the 1988 General Election, establishing an environmental resources trust fund, directs the holding of an environmental and natural resource congress at least once every biennium; and sets down guidelines for the expenditures of the Environmental Trust Fund. Money in the Trust Fund may be spent only for:

- The Reinvest in Minnesota (RIM) Program.

- Research to increase the effectiveness of protecting or managing the State's environment or natural resources.
- Collection and analysis of information that develops the State's environmental and natural resources policies.
- Enhancement of public education necessary for protection and conservation of natural resources.
- Capital projects for the preservation and protection of natural resources.
- Activities that preserve natural resources; and
- Administrative and investment expenses

The St. Anthony Falls Lab is 50!

Established in 1938 on the Mississippi River upstream from the Minneapolis Campus, the St. Anthony Falls Hydraulic Laboratory is one of the world's leading centers for research in hydromechanics and water resources engineering. Construction of the lab was a federal, state, municipal and private collaboration, and the laboratory serves clients in all these categories.

Studies at the Laboratory have emphasized hydraulic structures, naval hydrodynamics, river mechanics, and instrumentation. More recently the research has been expanded into environmental hydraulics, water quality, stochastic surface water and ground water hydrology, hydraulic machinery, and wind engineering.

Join the Minnesota Ground Water Association!

If you are reading this newsletter second-hand, we'd like to take this opportunity to invite you to become a member of MGWA. Annual dues are \$10 for professional members and \$5 for students.

Just complete the form below and mail to: Minnesota Ground Water Association, c/o Pat Bloomgren, Treasurer, 1114 Meadowview Drive, Stillwater, Minnesota 55082

Name _____
Affiliation _____
Mailing Address _____
City, State, Zip Code _____
Telephone Number _____

The Drought of 1988

By Lee Trotta

"This summer the drought has brought home to us the vital importance of rain, rivers, and water to human life and to all life."

These words by Steve Carlson, (Asian Business & Community news, August 1988) describe well the significance of this summer's drought from the focus of most Twin Cities news media. Given less airplay were significant changes in ground-water levels. According to Dan Zwilling of DNR (Water Talk, Summer, 1988) "New record lows for water table aquifers are being observed in east central Minnesota". Mother Nature is resilient, but no one can be sure when water levels will recover in Minnesota.

Lessons we have learned are that the state must be able to assess drought severity more efficiently so that the various stages of water management plans can be implemented when they will do the most good. Good public cooperation with water-management plans can

be expected only if the reasoning behind them is well understood.

During the height of the drought a vast area of the state had received less than half the precipitation of a normal year (Figure 1). Some of the precipitation deficit has been made up, as can be seen in the most recent map of percent of normal precipitation to date (Figure 2).

Drought Planning Workshop

Reprinted from Minnegrain, a publication of the Water Resources Research Center.

The extreme drought conditions of this past summer brought the Mississippi River to record low flow levels at the Twin Cities, as well as further down river. By late July, flow rates measured near Minneapolis were below 1000 cfs, less than a sixth of the average flow at that time of year; minimum flows around 800 cfs were reached for short periods

of time. The City of Minneapolis relies directly on the river as its source of water, and St. Paul uses river water to replenish small lakes that it uses as supply reservoirs. Sprinkling and other water-use bans were established, and the Governor's drought task force recommended that extra water be released from some of the lakes in the Upper Mississippi River basin. Although there was no serious concern that Minneapolis actually would run out of water, there was concern that water quality in the river would deteriorate and that fish and other aquatic organisms would be killed if flows continued to decline. (At flows much below 1000 cfs, the contribution of treated wastewater from the metro area to total river flow starts to become significant.)

The recommendation to release water from upstream lakes was controversial. Although the lakes are reservoirs constructed by the Corps of Engineers for flood control purposes (in the late 19th and early 20th century) in fact they have been used primarily as recreational lakes

Figure 1

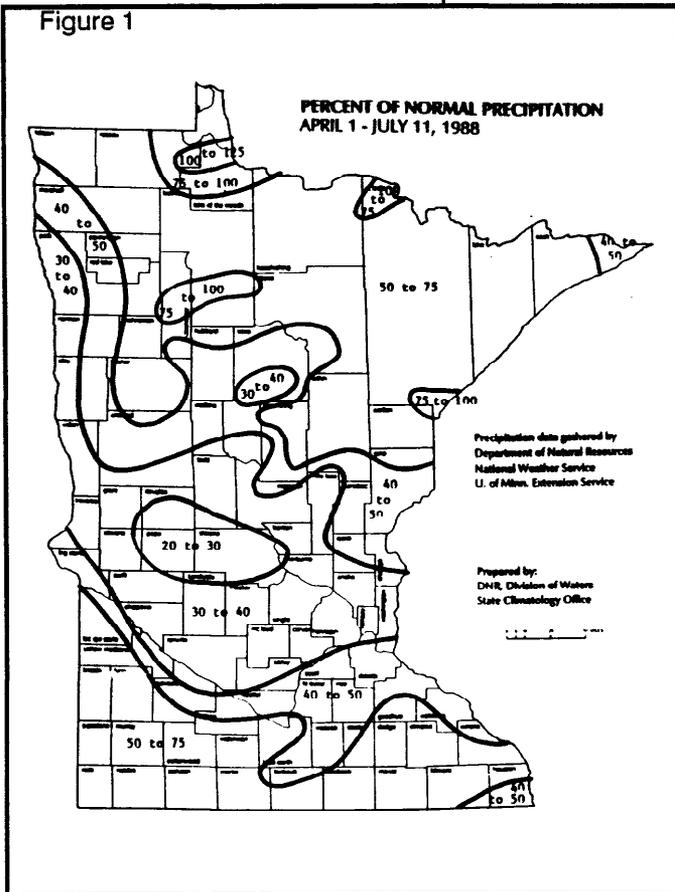
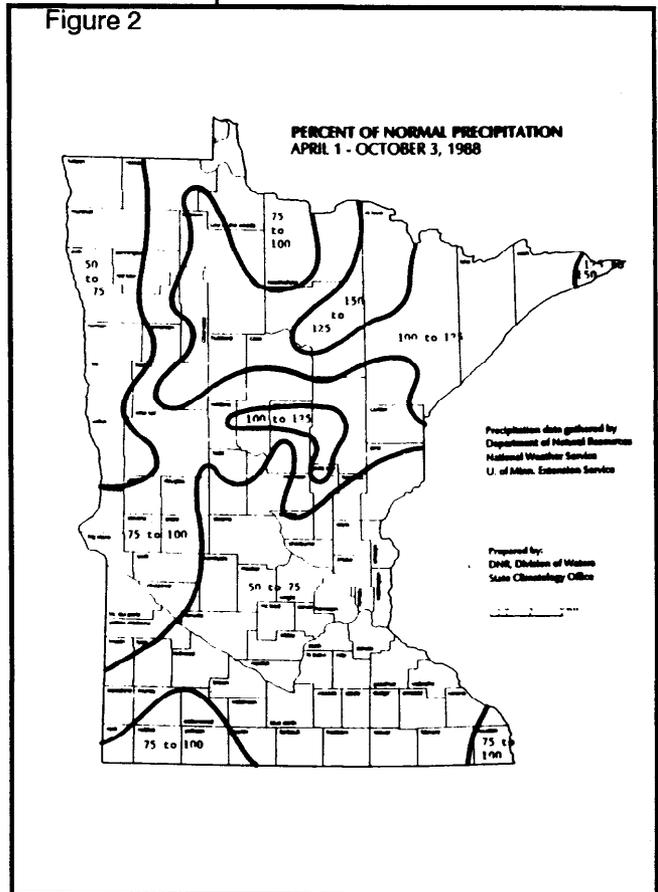


Figure 2



for many years. Resort owners were concerned that low lake levels would be detrimental to their businesses and native Americans were concerned that the releases would adversely affect wild rice growing along lake shorelines. The district chief of the U.S. Army Corps of Engineers, which regulates the reservoirs, rejected the request for water releases in early August, but the decision was not considered precedent setting. Heavy rains in the northern part of the drainage basin just prior to his ruling had broken the extreme drought, and flow rates in the river were projected to increase. Flows in the river have been well above the critical level of 1000 cfs since mid-August, and at least for now, the problem is resolved.

However, long term concerns remain about water supply the Twin Cities area (especially for Minneapolis in times of future drought. Minnesota Governor Rudy Perpich established a task force headed by Jack Ditmore, Chair of the EQB, to

evaluate water supply alternatives for the metropolitan area. The task force will meet this fall and prepare recommendations for further studies and action. Possible alternative water supplies for Minneapolis include development of a well field to supply ground water to the city (either to supplement or replace the current river-water supply) and construction of a reservoir exclusively for water supply purposes in the Upper Mississippi River basin.

The Water Resources Research Center will be cooperating with the task force in its deliberations and is sponsoring a workshop to define issues, review the status of knowledge of water availability supplies and needs and explore alternative solutions. The workshop is scheduled for October 25 and will be held in the St. Paul Student Center on the St. Paul campus. For further information, call the WRRC at (612) 624-9282.

MGS Publications

Inquiries and orders for MGS publications should be directed to Maps and Publications Sales (612) 627-4782

Geologic Map of the Sherry Lake Quadrangle, Itasca Count, Minnesota by M. A. Jirsa. (Miscellaneous Map Series M-64). Bicolored bedrock geologic map. Included on the sheet is a discussion of the stratigraphy, metamorphism, and structure of the Archean and Early Proterozoic rocks in this quadrangle.

Data Base, Bedrock Topographic, and Drift Thickness Maps of the Mesabi Range, Hibbing to Virginia Area, Minnesota by B. A. Bloomgren, T. G. Guyer, D. R. Kunze, R. E. Rutanen, and A. R. Streitz. (Open File Report 88-1). This mapping was supported by the Iron Range Resources and Rehabilitation Board.

Geologic Map of the Penokean Orogen, Central and Eastern Minnesota, and Accompanying Text by D. L. Southwick, G. B. Morey,

and P. L. McSwiggen. (Report of Investigations 37). The geology of the Animikie basin and contiguous rocks of Early Proterozoic age in central and eastern Minnesota (Collectively constituting the western end of the Penokean orogen) is reinterpreted in terms of plate-tectonic theory on the basis of new geophysical and geological data.

Pirated from the Minnesota Geological Survey Newsletter (and made even more entertaining by recent Olympic events):

The Planetarium at the Minneapolis Public Library recently opened a show on the "Death of the Dinosaurs". Public notice for it appeared in community newspapers around the Twin Cities, including one from White Bear Lake spotted by Dale Setterholm that named "steroid impacts on earth" as one of the popular theories to explain the dinosaurs' demise.

New North Dakota Atlas Map Available.

Sidney B. Anderson, Acting State Geologist, announces the release of Atlas Series Map 4 by the North Dakota Geological Survey. This map, titled "Surface Geology of the Souris River Map Area, North Dakota, was drawn by Mark L. Lord. The map covers a part of north-central North Dakota, north of 48° North Latitude and Between 100° and 101° West Longitude; most of the area is in McHenry and Bottineau Counties. Each map in this series covers an area of one degree of longitude by one degree of latitude. The total area covered by Atlas Series Map 4 is about 3250 square miles.

This colored Atlas map shows the composition of the surface materials and their origin. Four elements of the surface geology of the Souris River Map Area are shown on the map: 1 the lithologies and textures of the surface materials; 2 an interpretation of the age of the sediment; 3 a description of the topography of the area; and 4 a description of the origin of the sediment. Lithologies are shown by the use of color. The age and origin of the sediment are shown by the use of map-unit numbers. A detailed description of the map unit and line symbols area also included.

The Souris River Map Area can be divided into three areas based on the occurrence of similar or genetically related landforms. These areas include the Glacial Lake Souris plain, the Turtle Mountains, and the Glaciated Plains. Each of these areas has a unique set of landforms determined by the geological processes responsible for depositing or modifying the sediment in the area.

The Souris River Atlas Map 4 is drawn at a scale of 1:250,000 (1 inch to 4 miles). The map can be obtained for \$3.00 from the North Dakota Geological Survey, University Station, Grand Forks, ND 58202-8156.

Straight River is Target of Intensive Ground Water Study

By Dan Zwilling, MN DNR,
Division of Waters

The trout living in the Straight River near Park Rapids can sleep well tonight knowing that steps are being taken to ensure their quality of life will be maintained. The Minnesota Department of Natural Resources and the U.S. Geological Survey have teamed up on a unique project to evaluate impacts of irrigation on this designated trout stream.

The Straight River provides an excellent study site for this project. Its cool, clear water supports an excellent population of brown trout. The river is approximately 15 miles long from its source in Becker County to its confluence with the Fishhook River in Hubbard County. An outwash plain consisting of an extensive surficial aquifer and numerous smaller buried outwash aquifers provides its geological setting. Both the surficial outwash and buried drift aquifers are heavily pumped for irrigation. These aquifers also provide the cool, clear water which makes the Straight River what it is.

In the past decade a significant change in land use has occurred in this 80 square mile watershed. In 1974, there were only five irrigation systems in operation. Now there are about 70. Most irrigation occurs within two miles of the Straight River. The change from dryland farming to intensive crop irrigation has also been accompanied by increased use of pesticides and fertilizers.

While the study will concentrate initially on the impacts of irrigation on stream temperature and water quality for fish management concerns, other issues will also be studied.

The increased use of pesticides and fertilizer has led to concern by residents in the area about the quality of their drinking water. These concerns are very real. Samples taken in the spring of 1987

substantiated the presence of elevated nitrate levels in ground water below irrigated land, non-irrigated lands and feed lots. In fact, the Department of Health has required several small businesses and public agencies in the area to drill new and deeper wells due to high nitrate levels.

The objectives of the project are to:

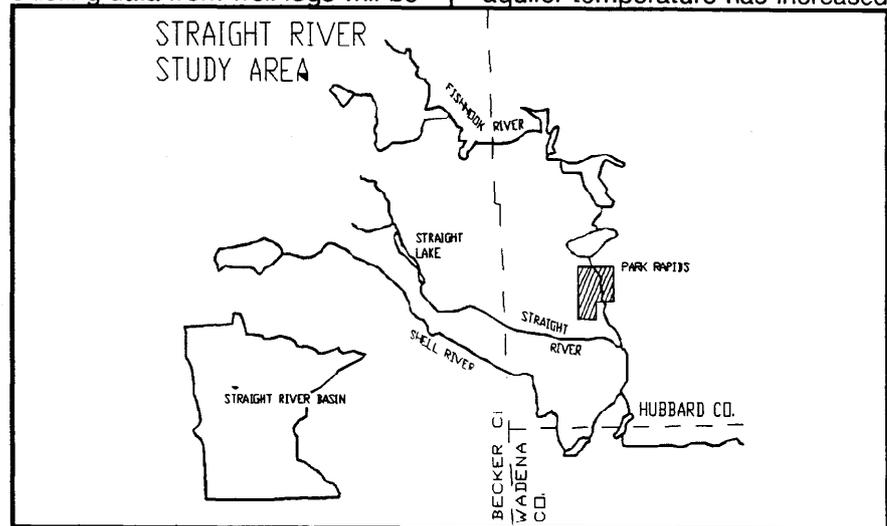
- evaluate the effect of intensive ground water withdrawals on water temperatures and water quality of the Straight River,
- explore the feasibility of water use management techniques to balance the need for ground water use with the need to maintain river and ground water quality, and
- apply a recently developed heat and solute transport ground water model.

In the first phase of the project, existing data from well logs will be

and the adjacent groundwater and aquifer.

The final stage of the project will be the construction of a three-dimensional ground water flow model. The model will be calibrated using the aquifer hydraulic properties, water levels and water use data compiled during the study. Once calibrated to long term and seasonal hydrologic conditions, the model will be used to analyze ground water discharge to the river. Hence, estimates of ground water level decline, streamflow depletion and changes in direction and rate of flow of ground water can be extrapolated for various pumping levels. The calibrated model will be used to explore options for management of irrigation withdrawals so that the effect on degradation of water quantity and quality is minimized.

If data indicate that river or aquifer temperature has increased



analyzed to map out the underground geology. Aquifer pumping tests will be conducted to determine the various complex hydraulic characteristics of the aquifers. Water levels will be also monitored in over 150 existing wells to help explain the overall picture.

The river itself will be also studied extensively at several locations to determine flow characteristics, water quality at different times of the year, and water temperature changes. Extensive testing will also be done to determine the temperature and hydraulic relationships between the stream channel

due to irrigation, or if contamination from nutrients or pesticides is documented, the heat solute model will be constructed. The model will be calibrated by matching hydraulic heads, solute concentrations, and temperatures measured in the field. The effects of increased stream temperatures resulting from decreased base flow and the effects of irrigation return flow will then be able to be evaluated with the model.

We hope the results of this study will be applicable to streams in other parts of the state where similar potential conflicts exist. Fish will not be the only species to benefit from this project.

**MINNESOTA GROUND WATER ASSOCIATION
MINNESOTA ENVIRONMENTAL HEALTH ASSOCIATION
MINNESOTA DEPARTMENT OF HEALTH, DIV. OF ENVIRONMENTAL HEALTH**

Joint seminar on
**WATER TREATMENT OPTIONS:
coping with contaminated water**

November 1, 1988

Earle Brown Center
University of Minnesota
St. Paul Campus

Agenda

- 12:00 pm Registration and Exhibits
- 12:45 pm **Welcome and Opening Remarks**
L. Lehman, President of MGWA
- 1:00 pm **Ion Exchange for Selective Contaminant Removal**
Bruce A. Johnson, Manager, Industrial Division, Robert B. Hill Company, Minneapolis, Minnesota
- 1:30 pm **Overview of Reverse Osmosis Separation Technology: Applicability to the Treatment of Contaminated Ground Water**
Terry Marsh, Development Leader, Dow Chemical Company, Midland, Michigan
- 2:00 pm **Water Quality Improvement and Contaminant Removal Using Reverse Osmosis Technology**
Jerry Soost, Laboratory Supervisor, Coster Engineering, Mankato, Minnesota
- 2:30 pm Break and Exhibits
- 2:45 pm **A Novel Membrane Process for Stripping Volatile Organic Chemicals from Ground Water**
Dr. Michael Semmens, Associate Professor, Department of Civil & Mineral Engineering, University of Minnesota, Minneapolis, Minnesota
- 3:15 pm **Organic Removal by Carbon Adsorption and Air Stripping**
Tim Peschman, Vice President, Carbon Air Services, Inc., Hopkins, Minnesota
- 3:45 pm **Case History: Field Application of Carbon Filters**
Chris Wilker, Manager, Drinking Water Products, Ecowater Systems, Woodbury, Minnesota
- 4:15pm Refreshments and exhibits

Registration fees: \$15.00 professionals; \$5.00 students.

*Detach this portion and send with payment (Check made out to MGWA) by October 26, 1988.
Please make any necessary corrections to your address. Mail to MGWA, c/o Pat Bloomgren, Treasurer,
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Water Exports from Minnesota Watersheds

An amazing amount of water (at least 96% ground water) is being exported from one major ground-water basin (defined as subregions) to another in Minnesota, according to a report released by the U.S. Geological Survey. Water is exported from 8 of the 13 subregions in this study using 57 conveyances. These conveyances originate in 16 counties and range from the 4 conveyances exporting less than 0.01 Mgal/d to an export of 3.45 Mgal/d from the City of Edina's sewer conveyance. Four of the conveyances (2 in Minnetonka, and 1 each in Edina and Minneapolis) account for 41 percent of the exports between subregions. The total amount of water exported by the 57 conveyances was about 26.8 Mgal/d in 1985. This is equivalent to the flow of the entire Little Cottonwood River near Courtland, Minnesota. The City of Hopkins public-supply conveyance, built in 1880, is the oldest conveyance. Historical trends can be examined by applying the percentage of export to historical pumping totals available in the Minnesota Water Use Data System. Data for 1973-1982 have already

been published in another report for several conveyances. The history of interbasin transfer in the drainage-ditch category gives insight to the hydrologic effects of large transfers of water and provides information needed by water system managers and planners in developing water budgets.

The report *Inventory of Interbasin Water Transfers in Minnesota* by Lee Trotta is included in the proceedings of the Symposium on *Water Use Data for Water Resource Management* sponsored by the AWRA in Tucson, Arizona, this year.

Copies are available from the AWRA (Cost is \$49.00 for members and \$59.00 for nonmembers) and an open-file version of the report will be out in a couple of months.

Field Equipment For Sale

Bailers - 2 stainless & 1 adjustable length PVC for \$90 each; Chemcadet pH, EC, T Meter for \$300; Powers two wire sounder for \$150; Tri-loc PVC had pump (100' depth) for \$300; MSA CGI-Oxy meter for \$900. All items in new or near-new condition and can be shipped. Contact Jim DuBois at Box 9, Rhinelander, WI 54501 or at (602) 257-2101

Conference on Advances in Ground Water

The 1988 conference on Advances in Ground Water Hydrology will be held in Tampa, Florida on November 16 - 18 at the Harbor Island Hotel. Dedicated to the memory of C.V. Theis, the conference will highlight recent advances and future need in ground water hydrology. Speakers and attendees will represent 31 states and 20 foreign countries.

Events will include a special session on C.V. Theis, his life and work, and a short course on the application of computer models (namely the analytic element method) to ground water problems.

Session topics will include aquifer properties; ground water/surface water interactions; contamination, exploration, flow, management, modeling, and the quality of hydrogeologic mapping; the unsaturated zone; and well hydraulics. The 21 session program with three concurrent sessions allows participants to choose from over 100 papers presented by outstanding leaders in their fields.

For further information, contact AIH at (612) 379-1030.

Election Ballot

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Ballots should be mailed to Gordy at Sunde Engineering, 9001 W. Bloomington Fwy., Bloomington, MN 55420

Fall Geology and Geophysics Seminars

Seminars are presented on Thursdays (unless otherwise noted) at 3:15 pm in 110 Pillsbury Hall, followed by refreshments in 121 Pillsbury Hall.

October 20 Dr. Thompson Webb III, Brown University Department of Geological Sciences, Candidate for Limnological Research Center Director. *History of Vegetation and Climate in Eastern North America During the Past 18,000 Years* and

October 21 (Friday, 10:15 am) 121 Pillsbury Hall. *Do Species Migrate?*

October 27 Dr. Michael Brown, Kingston Polytechnic, Surrey, England. Head, School of Geological Sciences. *The Archean Geology of the Godthåbsfjord Region of Southern West Greenland.*

November 10 Professor Valery Mironenko, Leningrad Mining Institute Department of Hydrogeology and Engineering Mining, USSR. *Ground Water Pollution and Protection in USSR.*

December 1 Dr. Michael Gurnis, University of Michigan Department of Geological Sciences. *Convective Mixing in the Earth's Mantle.*

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News of members

Mark Collins has returned to Minnesota from the Illinois State Water Survey. He has joined Braun Engineering as the supervisor of hydrogeological investigations.

John Fax and Chris Hughes, both formerly with the DNR's Division of Waters, have joined the Board of Soil and Water Resources staff.

Gil Gabanski has joined Warzyn Engineering where he is in charge of the Environmental Division.

Lee-Ann Hammerbeck has joined Braun Engineering.

Dave Kill formed Recovery Equipment Supply, Inc.

Jane Willard and Deborah Carroll formed EnPro Assessment Corp.



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