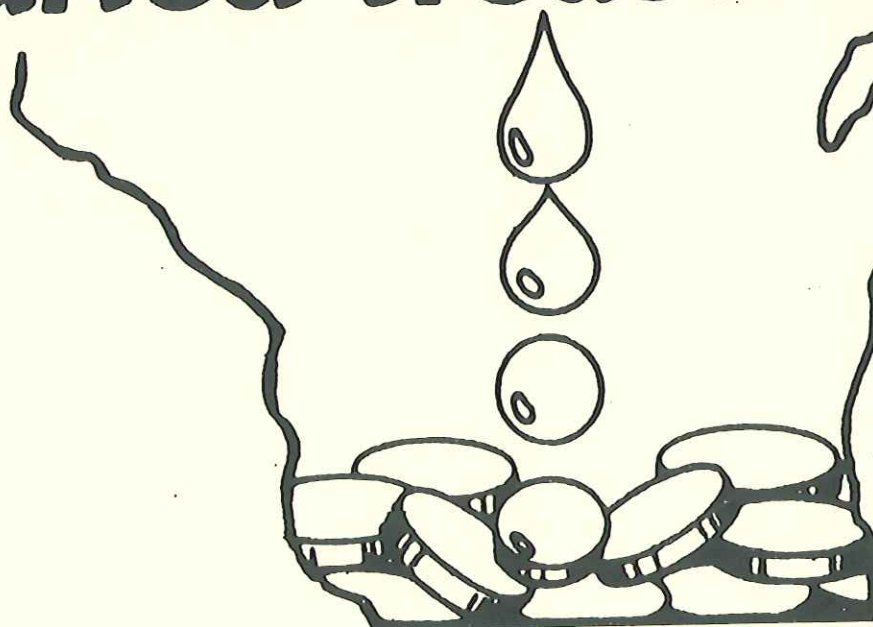


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**WISCONSIN GROUNDWATER  
COORDINATING COUNCIL**

***Wisconsin's  
buried treasure***



**REPORT TO  
THE LEGISLATURE**

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August 1992

## GROUNDWATER COORDINATING COUNCIL MEMBERS

Department of Natural Resources - Lyman Wible (Chair)  
Department of Agriculture, Trade and Consumer Protection - Nick Neher  
Geological and Natural History Survey (State Geologist) - Ron Hennings (Acting)  
Governor's Representative - John Metcalf  
Department of Health and Social Services - Dr. Henry Anderson  
Department of Industry, Labor and Human Relations - Michael Corry  
Department of Transportation - Theodore Stephenson/Carol Cutshall  
University of Wisconsin System - Albert Beaver

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Department of Health and Social Services - Henry Anderson and Lynda Knobeloch  
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August 31, 1992

IN REPLY REFER TO: 3230

The Honorable Governor Tommy G. Thompson  
Senate Urban Affairs, Environmental Resources, Utilities and Elections Committee  
Senate Transportation, Conservation and Mining Committee  
Assembly Environmental Resources, Utilities and Mining Committee  
Assembly Natural Resources Committee  
Secretary Charles H. Thompson - Department of Transportation  
Secretary Carol Skornicka - Department of Industry, Labor and Human Relations  
Secretary Alan T. Tracy - Department of Agriculture, Trade and Consumer Protection  
Secretary Gerald Whitburn - Department of Health and Social Services  
Secretary Carroll D. Besadny - Department of Natural Resources  
President Katharine Lyall - University of Wisconsin System  
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Albert Beaver  
UWS

Enclosed is the 1992 Groundwater Coordinating Council (GCC) Report to the Legislature as required by state law. The Council was formed to help state agencies coordinate non-regulatory activities and the exchange of information related to groundwater. Among the groundwater accomplishments by the state agencies during the past year have been:

John Metcalf  
GOVERNOR'S REP.

- reduction in the use of atrazine due to creation of additional management areas and prohibition areas based on atrazine findings.
- development of comprehensive draft regulations covering remedial responses to environmental contamination.
- adoption and implementation by the GCC of action recommendations to improve coordination and communication on groundwater management issues.
- development of a Local Government Subcommittee of the GCC to provide improved state-local coordination on groundwater management issues.
- provision of improved access to the DNR's groundwater information network and development of a more uniform system for data collection, sharing and management among state agencies.

We hope you, your staff and the public will find this report useful in protecting Wisconsin's valuable groundwater resource.

Sincerely,

Lyman F. Wible, Chair  
Groundwater Coordinating Council



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## EXECUTIVE SUMMARY

This is the Report to the Legislature by the Groundwater Coordinating Council (GCC) as required by s. 15.347, Wisconsin Statutes. The report describes the condition of the groundwater resource, its management and summarizes the Coordinating Council's activities for fiscal year 1992.

In 1984, the Legislature enacted Wisconsin Act 410 with the intention of improving the management of the state's groundwater. The GCC is directed by s. 160.50, Wis. Stats., to "serve as a means of increasing the efficiency and facilitating the effective functioning of state agencies in activities related to groundwater management. The Groundwater Coordinating Council shall advise and assist state agencies in the coordination of nonregulatory programs and the exchange of information related to groundwater, including, but not limited to, agency budgets for groundwater programs, groundwater monitoring, data management, public information and education, laboratory analysis and facilities, research activities and the appropriation and allocation of state funds for research."

Membership of the GCC includes the Secretaries of the Departments of Natural Resources (DNR); Industry, Labor and Human Relations (DILHR); Agriculture, Trade and Consumer Protection (DATCP); Health and Social Services (DHSS); Transportation (DOT); the President of the University of Wisconsin System (UWS); the State Geologist; and a representative of the Governor. Members are listed on the inside of the front cover.

Since its last report, the Groundwater Coordinating Council has accomplished the following:

1. The GCC followed up the conference titled "Working Together to Manage Wisconsin's Groundwater - Next Steps?" held in Stevens Point last year by adopting action recommendations for 1992. The recommendations include establishment of an information clearinghouse, coordination of geolocated databases, review of data confidentiality, better efforts at coordination of Clean Sweep activities, creation of a Local Government Subcommittee for the GCC, endorsement of risk assessment information and education, promotion of wellhead protection funding and wider distribution of the Report to the Legislature. The nine action recommendations are listed in Table 3 of this report.
2. The GCC has contacted agencies representing local units of government to discuss creation of a Local Government Subcommittee for the GCC to address their groundwater concerns. Formation of such a subcommittee will be discussed at the August GCC meeting.
3. Computer hardware and software have been provided to the DATCP, WGNHS, DHSS, DILHR and the Central Wisconsin Groundwater Center to improve access to computerized groundwater information through the Department of Natural Resource's Groundwater Information Network (GIN). The GIN system is being redesigned to provide a more uniform system for data collection, sharing and management among state agencies.
4. The Groundwater Coordinating Council and the University of Wisconsin System Groundwater Research Advisory Council continued coordination of the annual solicitation for groundwater research and monitoring proposals among state agencies. Thirty two projects were funded in FY (fiscal year) 92 by one or more of the following agencies: UWS, DATCP, DNR and DILHR. The projects funded are listed in Table 1. The locations of the field sites for the projects are shown in Figure 2. A joint solicitation for groundwater-related monitoring and

research project proposals for funding in FY 93 was distributed in November, 1991. A copy of the joint solicitation is contained in the appendix to this report. A total of 27 project proposals were received. Twelve new projects were selected by the UWS, DNR or DATCP for funding in FY 93 in addition to 16 projects which will carry over into the new fiscal year. The FY 93 groundwater monitoring and research projects and their funding agency are listed in Table 2. The GCC endorsed the UWS groundwater research plan as required by s. 160.50(1m), Wis. Stats.

5. The GCC has continued to work with representatives of federal agencies to promote communication and coordination of federal and state groundwater activities. Representatives from the U. S. Soil Conservation Service (SCS), U. S. Agricultural Stabilization and Conservation Service (ASCS) and the U. S. Geological Survey (USGS) attend GCC meetings and serve as ex officio subcommittee members.



## INTRODUCTION

### PURPOSE

The Groundwater Coordinating Council is required by s. 15.347, Wis. Stats., to prepare a report which "summarizes the operations and activities of the council ..., describes the state of the groundwater resource and its management and sets forth the recommendations of the council. The annual report shall include a description of the current groundwater quality of the state, an assessment of groundwater management programs, information on the implementation of ch. 160, Stats., and a list and description of current and anticipated groundwater problems." This report is due each August. The purpose of this report is to fulfill this requirement for fiscal year 1992.

The following section, "Summary of Agency Activities" describes groundwater management programs and implementation of ch. 160, Stats., by the individual state agencies. "Groundwater Monitoring and Research" provides information on monitoring and research activities to address groundwater issues in Wisconsin and describes the condition of the groundwater resource. The activities of the Groundwater Coordinating Council and its subcommittees are described under "Coordination Activities" and in the minutes which are contained in the appendix to this report. The recommendations of the Council are contained in "Directions for Future Groundwater Protection."

### SUMMARY OF WISCONSIN'S GROUNDWATER LEGISLATION

Wisconsin has a long history of groundwater protection. The culmination of this effort has been the adoption and implementation of 1983 Wisconsin Act 410, Wisconsin's comprehensive Groundwater Protection Act which was signed into law on May 4, 1984. This law greatly expanded Wisconsin's legal, organizational and financial capacity for controlling groundwater pollution. The Groundwater Protection Act created Chapter 160, Wisconsin Statutes, which serves as the backbone of Wisconsin's program. Chapter 160, Stats., provides a multi-agency comprehensive regulatory approach, using two-tiered numerical standards, based on the premise that all groundwater aquifers in Wisconsin are entitled to equal protection. There are a number of major components to Wisconsin's groundwater protection program:

- 1) Standards. Under Chapter 160, Stats., the Department of Natural Resources (DNR) is required to establish state groundwater quality standards based on advice from the Department of Health and Social Services. Standard setting is a continuing process based upon a priority list established by the DNR in conjunction with other state agencies. The state groundwater standards are contained in Chapter NR 140, Wisconsin Administrative Code.
- 2) Regulatory Programs. Once standards are established, all state agencies must manage their regulatory programs to comply. Each state regulatory agency must have rules to assure that the groundwater standards are met and to require appropriate responses when the standards are not met. The state regulatory agencies are the Department of Natural Resources (solid and hazardous waste, industrial and municipal wastewater, spills); the Department of Industry, Labor and Human Relations (septic systems, petroleum product storage tanks); the Department of Agriculture, Trade and Consumer Protection (pesticide use and storage and fertilizer storage); and the Department of Transportation (salt storage). The implementation

of the groundwater standards by the state agencies is described under "Summary of Agency Activities".

- 3) Aquifer Classification. One of the most important features of Wisconsin's groundwater law is something that is not in it. At the same time Wisconsin was debating the groundwater protection legislation, the U. S. Environmental Protection Agency (EPA) tried to develop a nationwide groundwater approach. A keystone of EPA's proposal was aquifer classification - a scheme whereby each aquifer would be classified according to its use, value or vulnerability and then would be protected to that classification. This entailed the "writing off" of certain aquifers as industrial aquifers not entitled to protection and never again usable for human water supply. Wisconsin said "no" to aquifer classification. The philosophical underpinning of Wisconsin's groundwater law is the belief that all groundwater in Wisconsin is capable of being used for people to drink and must be protected to assure that it can be.
- 4) Monitoring and Data Management. At the time the groundwater legislation was created, there was concern that Wisconsin needed a groundwater monitoring program to determine whether the groundwater standards were being met. Therefore, a groundwater monitoring program was created under s. 160.27, Stats. Money from the Groundwater Account of the Environmental Fund has been used for problem assessment monitoring, regulatory monitoring, at-risk monitoring and management practice monitoring as well as establishment of a data management system for collection and management of the groundwater data. See the "Groundwater Monitoring and Research" discussion in this report for further information.
- 5) Research. Although all state agencies must comply with the groundwater standards, the processes by which groundwater becomes contaminated, the technology for clean-up, the mechanisms to prevent contamination and the environmental and health effects of the contamination are often not well understood. In addition the basic data on geology, soils, and groundwater hydrology is often not available. The University of Wisconsin System (UWS) and the state agencies have recognized that additional efforts in these research areas are badly needed. The Governor and the Legislature included a new groundwater research appropriation for the UWS beginning with the 1989-1991 biennial budget. During the past year, the UWS and the Departments of Agriculture, Trade and Consumer Protection and Natural Resources participated in a joint solicitation for groundwater-related research and monitoring proposals for funding during fiscal year 1993. See the "Groundwater Monitoring and Research" discussion for more details.
- 6) Coordination. In establishing the groundwater law, the Legislature recognized that management of the state's groundwater resources was a responsibility divided among a number of state agencies. Therefore, the Groundwater Coordinating Council was created to advise and assist state agencies in the coordination of non-regulatory programs and the exchange of information related to groundwater. The Coordinating Council has been meeting since 1984. See the "Coordination Activities" discussion in this report.
- 7) Local Groundwater Management. The Groundwater Protection Act clarified the powers and responsibilities of local governments to protect groundwater in partnership and consistent with state law.
  - a. Zoning authority for cities, villages, towns and counties was expanded to "encourage

the protection of groundwater."

- b. Counties can adopt ordinances regulating disposal of septage on land (consistent with DNR requirements); cities, villages or towns may do so if the county does not.
- c. Counties can regulate (under DNR supervision) well construction and pump installation for certain private wells.
- d. Property assessors must consider the time and expense of repairing or replacing a contaminated well or water supply when assessing the market value of real property; they must consider the "environmental impairment" of the property value due to presence of a solid or hazardous waste disposal facility.

The following report is intended to update the Legislature and Governor on the status of the state's groundwater program and the activities of the Groundwater Coordinating Council.



## SUMMARY OF AGENCY ACTIVITIES

The following summary describes the groundwater management efforts undertaken by the member agencies of the Groundwater Coordinating Council during the past year. As these summaries show, Wisconsin continues to have a strong commitment to protection of the groundwater resource.

### DEPARTMENT OF NATURAL RESOURCES

The Department of Natural Resources (DNR) has statutory authority as the central unit of state government to protect, maintain and improve groundwater within the state (s. 144.025(1), Wis. Stats.). The DNR establishes the groundwater quality standards for the state under authority of s. 144.025(2)(b) and ch. 160, Wis. Stats. In addition to the establishment of groundwater quality standards, DNR has specific regulatory programs.

DNR regulatory programs to protect groundwater fall into one of three categories: water supply, wastewater and solid and hazardous waste management. In addition, the Groundwater Management Section (GMS) assists in coordinating groundwater activities within the DNR, as well as with other state agencies. The GMS is responsible for adoption of groundwater standards contained in ch. NR 140, Wis. Adm. Code, development of an annual groundwater monitoring plan, coordination of the solicitation, review and management of groundwater monitoring projects and maintenance of a data management system for groundwater data.

In August of 1991, the DNR Natural Resources Board adopted amendments to ch. NR 140, Wis. Adm. Code, in conjunction with the Department of Health and Social Services (DHSS), to add groundwater standards for 12 new substances and modify the standards for 2 substances. The standard for atrazine was changed from 3.5 to 3.0 micrograms/liter and was modified to include three chlorinated metabolites or breakdown products.

Based on controversy regarding what the enforcement standard for polychlorinated biphenyls (PCBs) should be, the Board directed that a Technical Advisory Committee (TAC) be established to develop a health-based groundwater standard for PCBs. The TAC was formed in February and has met several times to discuss the technical issues related to a PCB standard. The TAC will hold its last meeting in August and make recommendations for the Natural Resources Board.

The Bureau of Solid and Hazardous Waste Management formed an external advisory committee and began to develop a series of administrative codes (NR 700-736) covering remedial responses to environmental contamination. The rules also will provide comprehensive regulations to address soil contamination. Public hearings on the proposed rules are anticipated during FY 93.

The DNR continued its groundwater monitoring program which includes problem assessment monitoring, at-risk well monitoring, management practice monitoring and regulatory monitoring. During fiscal year 1992, approximately \$335,000 was awarded to 18 projects for the management practice monitoring program. Fourteen projects were new studies selected during the joint solicitation process described under "Groundwater Monitoring and Research" in this report. Four projects funded by the DNR in FY (fiscal year) 92 were continuing studies that had been funded in FY 91. The eighteen projects are listed in Table 1.

The wastewater program continues to issue permits for wastewater discharges to groundwater. New

municipal wastewater permits reflect the more stringent effluent limits for nitrogen contained in ch. NR 206, Wis. Adm. Code. A concerted effort is also being made to evaluate and require upgrading of groundwater monitoring systems in place at existing permitted facilities.

The DNR is continuing to assist communities considering land treatment as an option for disposal of treated wastewater. Research is presently being conducted to develop new methods of improving the effectiveness of community rapid infiltration systems.

The DNR is currently assessing all industrial wastewater storage and treatment lagoons to determine compliance with the revised standards in ch. NR 213, Wis. Adm. Code. Over 170 facilities are required to prepare and submit evaluations by June 30, 1992. Follow-up actions will be taken by the DNR as necessary depending on the adequacy of liners, monitoring systems, and geologic conditions.

During FY 92, private wells in eight new priority watersheds were sampled for nitrate and triazine pesticides (of which atrazine is the most common) as part of the joint DNR-DATCP nonpoint source program. Sampling was offered to well owners free of charge and on a voluntary basis. All wells sampled were assigned a unique well number and inventoried. The primary sampling objective was to provide private well owners with information and education on well testing and groundwater. A secondary objective of sampling was to look at the quality of drinking water in the selected priority watersheds. A total of 1,317 nitrate and 1,220 triazine analyses were performed. The results are summarized under the discussion of the Condition of the Resource.

During FY 92, the Bureau of Water Supply initiated several groundwater monitoring projects aimed at determining the impact of surface activities on groundwater. These included: sampling of drinking water wells in the vicinity of orchards and airports in southern Wisconsin, sampling for arsenic in northeast Wisconsin, sampling near ginseng farms in north central Wisconsin, and sampling municipal wells using the triazine screen in the western part of the state.

The DNR is currently working on plans for a wellhead protection program. Amendments to the Safe Drinking Water Act (SDWA) of 1986 established the first nationwide program to protect groundwater used for public water supplies from a wide range of potential contamination sources through the establishment of state wellhead protection programs. The development of this type of program would be an important step in providing additional protection of the state's public water supplies.

For more information, contact Mr. Kevin Kessler, DNR, P. O. Box 7921, Madison, Wisconsin 53707-7921; phone: 608-267-9350. The appendix contains a listing of groundwater-related documents published by the DNR during FY 92 and information on their availability.

## DEPARTMENT OF AGRICULTURE, TRADE AND CONSUMER PROTECTION

Protection of Wisconsin's groundwater is of the highest priority for the Department of Agriculture, Trade and Consumer Protection (DATCP). DATCP's major activities in this area include management of pesticides, research, and funding local soil and water resource management projects.

Under the Wisconsin Groundwater Law, DATCP is responsible for managing pesticides and pesticide practices to assure that established groundwater standards for contaminants are not exceeded. This can include prohibition of certain activities including pesticide use. The agency has a further

objective to manage practices to "minimize" groundwater contamination to the extent "technically and economically feasible". Pesticide practices regulated by DATCP include storage, handling, use and disposal. DATCP also regulates the storage of bulk quantities of fertilizer.

Enforcement standards have been established in Wisconsin for several known and potential groundwater contaminants including 30 pesticides. Standards for additional pesticides have been proposed. In response to concerns about atrazine contamination, DATCP amended administrative rule ch. Ag 30 in 1992 to manage the use of atrazine in an effort to reduce or eliminate the potential for further groundwater impacts. Annual rule revisions are anticipated to respond to additional groundwater detects. Rule revisions for 1992 that create additional atrazine management areas and prohibition areas have already been enacted to address groundwater findings available as of April 1991. Proposed rule amendments for 1993 are in preparation which take into account the revised atrazine standard and additional atrazine findings. Information suggests that atrazine use has declined as a result of the atrazine management rule and concern about groundwater contamination.

In 1991, a cooperative sampling effort was conducted with DNR to further characterize atrazine contamination in and around the Atrazine Management Areas. These results were used in refining Atrazine Management Area delineations in the 1992 rule amendments.

DATCP and DNR staff authored the February 1992 publication "Follow Up to the Grade A Dairy Farm Well Water Quality Survey" which analyzed the results of a resampling of 69 wells with pesticide detects from the original Grade A Dairy Well Survey and 212 nearby wells. The report states that 83% of the wells originally found to have pesticides still had detectable levels upon resampling. 30% of the nearby wells had detectable levels of pesticide. Atrazine was the most frequently detected pesticide.

DATCP and DNR jointly developed the "Report on Wisconsin Pesticide Mixing & Loading Site Study" which describes the results from a study of soil and groundwater contamination at 27 agricultural facilities across Wisconsin. Results indicate that soil and groundwater contamination is common at these facilities. 25 sites had soils containing pesticides. Groundwater from 15 of these sites contained pesticides and 9 had pesticide levels above the enforcement standard. Both agencies recommend soil monitoring at commercial agricultural business sites. Additional groundwater monitoring will also be needed.

The Department contributed to the development of DNR rules (NR 700 series) that will establish soil cleanup standards.

DATCP funded one pesticide research project at a cost of \$22,500 during the past year. Approximately \$125,000 will be available next year through fees from pesticide manufacturers as a result of the pesticide law.

DATCP, through its soil and water resource management program, provides funding to primarily to counties to assist in the protection of these resources. An increasing portion of this funding is dedicated to the development and implementation of better nutrient and pesticide management practices. \$176,000 has been provided to develop and demonstrate better management practices for nutrients and pesticides. This funding level is expected to increase. Funding has been provided for the following projects: development of a county wide geographic information system (GIS) to evaluate hydrogeologic factors and landuse practices with potential for groundwater contamination

in Dane county; development of a groundwater management plan in Burnett county; implementation of nutrient management practices on selected farms in Buffalo, Chippewa, Manitowoc, and Marathon counties; and, an economic analysis of nutrient and pesticide management practices conducted by the UWEX-NPM Program.

DATCP provided \$401,000 to fund projects in 13 counties for collection and disposal of waste pesticides and containers. More than 82,000 pounds of these wastes were collected from farm sites, thereby reducing the potential for inadvertent environmental damage. DATCP is requesting additional proposals from counties for the 1993 fiscal year. Approximately, \$500,000 will be available during FY 93 for these projects.

For further information, contact Mr. Nicholas Neher, DATCP, 801 W. Badger Road, Madison, Wisconsin, 53713; phone: 608-266-7130. The appendix contains a listing of groundwater-related documents published by the DATCP during FY 92 and information on their availability.

## DEPARTMENT OF INDUSTRY, LABOR AND HUMAN RELATIONS

The Department of Industry, Labor and Human Relations (DILHR) regulates three major activities that impact groundwater. Through the Department's Bureau of Petroleum Inspection and Fire Protection, the agency regulates the installation and operation of over 140,000 underground petroleum storage tank systems and manages the Petroleum Environmental Cleanup Fund (PECFA). The Department's Bureau of Building Water Systems regulates over one-half million septic systems statewide. These programs are currently undergoing change.

The Bureau of Petroleum Inspection and Fire Protection continued the implementation of the Flammable and Combustible Liquids code, ILHR 10, which became effective on May 1, 1991. The main objectives for FY 92 were the start up of the permit system for federally regulated underground petroleum storage tank (UST) systems and the development of a network of local inspectors.

The key purposes of the UST permit system are the verification that owners are carrying out their leak detection responsibilities and the update of information which is contained on the Bureau's tank data base. By the end of the year, over 15,000 permit applications had been issued and compliance was running at a 61% rate. Improving compliance with leak detection will continue to be a major focus and the permit system is now being supplemented by on-site inspections.

A primary key to effectively regulating petroleum product storage systems is the development of a trained network of inspectors. A training and certification program has been implemented and local units of government are starting to accept the program. Thirty eight agreements have been established with local municipalities for the operation of the tank program.

The PECFA program has been in operation since late 1988. The fund is designed to satisfy U. S. Environmental Protection Agency (EPA) requirements that tank owners be financially responsible and able to fund the costs of a site cleanup. The number and cost of PECFA claims continues to increase. PECFA, like most government funded third party insurance programs, faces increased utilization and increased unit costs. While the PECFA fund grew from \$24.7 to \$44 million in FY 93, this increase may not be adequate to meet demand.

Cost control has been a focus of the PECFA program for the last year. A joint report by the DNR



and DILHR identified a number of cost control and improvement measures for the program. Although the report met with wide acceptance, the Department has not been successful in obtaining the number of staff needed to fully implement the cost control measures. This remains a key goal. The major cost control variable is the site clean up standard. New rules, NR 700, are being developed by the DNR to define these standards. They will be published in FY 93.

The Private Sewage System program continues to experience a great amount of stress. The program has been criticized in past legislative audits for not having a code that conforms with the groundwater law. In addition, strong policy differences exist among groups promoting changes to the private sewage system code. The greatest disagreement centers on the purpose of the code: is the private sewage system code solely a public health code or should the code also serve to control land use by selectively blocking or inhibiting development?

The Department's position is that the private sewage system code is a public health and groundwater protection instrument; land use regulation is better accomplished by other methods, such as zoning. The Department is currently being sued by the Office of the Public Intervenor over a decision to accept petitions that may allow expanded use of the Wisconsin mound for new housing construction. The petitions, if granted, would allow mound construction on new sites to conform to the same standards as mounds permitted to replace failing private sewage systems.

DILHR is responsible for the regulation of over 600,000 septic systems, a number gleaned from the last census report. While current designs meet standards for treatment of biologic components of household sanitary wastes, they do not consistently reduce concentrations of nutrients such as nitrate prior to the point of standards application. There are no proven designs that consistently meet the standards. Given the strict standards in the rules and the difficulty in producing affordable complying septic designs, DILHR is concerned that full implementation of all standards would create a de facto ban on inground septic systems. DILHR believes that the Legislature did not intend to ban septic systems when it passed the groundwater law in 1984.

In order to meet the spirit of the law, DILHR continues to modify its codes to provide for improved septic treatment rather than creating severe limitations on septic system use. Two strategies will be used to promote the improvement of septic design: first, the rules will be modified to remove barriers and create incentives for the introduction of new designs developed by private industry and government agencies. Second, the state-sponsored research is being conducted through research funds and grants. The activities include the installation of an experimental private sewage facility at the Black River Falls Correctional Institute, investigation of alternative wastewater treatment products, drafting of a revised chapter ILHR 83, Wis. Adm. Code, and change in perspective regarding the petition for variance process.

Under a research appropriation granted the Department in 1989, DILHR contracted with a private consultant to evaluate and identify promising alternative wastewater treatment systems suitable for individual residential use. A report was produced that documented the identification and review process. Based on this report, an experimental station was designed to test alternative methods.

The Black River Falls facility began operation this summer. It will be in operation for at least two years, possibly longer depending on the information DILHR develops. The facility is managed by the consultant, who is receiving assistance from the University of Wisconsin Small Scale Waste Management Program.

The original purpose of the Black River Falls facility may be expanded. The management consultant has received inquiries from product manufacturers who want to test their products in Wisconsin and under controlled conditions. Thus, the facility may be expanded to encompass the design and operation of products and designs, either individually or in combination with each other.

DILHR is also seeking alternative wastewater treatment systems through other methods. DILHR continues to work with the residents of Washington Island as they experiment with upflow anaerobic filters and drip irrigation treatment and disposal systems. At this point, nine demonstration systems have been approved, and seven systems have been installed. Some of the installations have encountered difficulties, but DILHR has seen these problems as opportunities to learn the limitations and idiosyncrasies of these alternatives.

DILHR is working with manufacturers and distributors of wastewater treatment products to test the products in a variety of soil and site conditions for which traditional septic systems are unsuitable. DILHR is identifying a correlation between soil and mechanical treatment. The outcome will be the identification of the limits of soil treatment and corresponding level of necessary mechanical treatment. As a result, alternative treatment systems might be identified for sites where traditional septic systems are inappropriate. The outcome of these experiments will include a list of alternative private sewage system designs and or products that should address virtually any combination of soil or site limitations.

DILHR is also revising administrative rules to address responsibilities under the groundwater law. DILHR is drafting code language that embodies the direction the Department wants to code to take. This direction emphasizes the role of the consumer and regulated community as equal partners in groundwater protection. The direction also integrates three separate advisory code committees - for the private sewage system, platting, and proposed large system codes - into a single code committee considering a single, unified code.

Under the revised code, DILHR will focus on research, education, and management of the process of private sewage system design and operation. They will electronically report their activities to DILHR where the accumulated information will be used to spot trends and problems. DILHR will use this information to guide its training and other regulatory responses.

Chief among the design of the new code is the expected requirement for mandatory third-party maintenance of advanced technology private sewage systems. The major complaint leveled against the advance systems - a lack of proper maintenance - would be eliminated because every system would be managed by a DILHR-certified management entity.

DILHR has also recognized its responsibilities under administrative rules governing the petition for variance process. DILHR is granting variances on a case-by-case basis for new sites for which plans for proposed systems meet the intent of the private sewage system code. Previously, DILHR limited its approvals to replacement system sites only. Private industry has been quick to respond with alternative and innovative products and designs that they might have previously been reluctant to propose. As a result, DILHR believes its goal of identifying and approving affordable, reliable private sewage systems that meet all groundwater protection standards has been enhanced far beyond what it would have otherwise achieved.

For more information, contact Mr. Bennette Burks, DILHR, P. O. Box 7969, Madison, Wisconsin

53707-7969; phone: 608-266-0056.

## DEPARTMENT OF HEALTH AND SOCIAL SERVICES

Chapter 160, Stats., directs the Department of Health and Social Services (DHSS) to prepare draft groundwater standards for substances of health concern and specifies the protocol for developing the recommended standards. Groundwater standards recommendations are developed by DHSS for the substances at the top of a prioritized list identified by the DNR. DHSS sends the recommendations to the DNR which then proceeds through the rule-making process to amend ch. NR 140, Wis. Adm. Code. The DHSS has prepared and sent to the DNR draft recommendations for groundwater standards for 12 new substances and revised standards for 26 substances.

The DHSS also distributed money to local public health agencies this past year for projects requiring the use of DHSS funding at the State Laboratory of Hygiene (SLOH). The DHSS covered the costs of sampling materials and laboratory analysis at the SLOH, and assisted in the interpretation of the results. The projects focussed on human health issues of local concern, including groundwater monitoring. This is the second year that funding has been available. It is hoped that this effort can be incorporated into the annual joint solicitation by the UWS, DNR, DILHR and DATCP.

DHSS staff review advisory letters sent to well owners by DNR representatives. DHSS often provides additional advice and health risk information to owners of wells which are seriously contaminated with volatile carcinogenic compounds such as benzene. These letters explain the health effects of the specific contaminant and advise the homeowner regarding continued use of the water for bathing, laundry, etc. Owners of wells with nitrate levels in excess of 10 milligrams/liter (mg/l) also receive letters from DHSS. The purpose of these letters is to stress the importance of not feeding nitrate-contaminated water to infants under 6 months of age. These letters also describe the health effects and symptoms known to occur following consumption of water containing high nitrate levels.

The Department of Health and Social Services also investigates cases of water-related illness. We are currently investigating a case of clinical methemoglobinemia in a 7-week old Trempealeau County infant. DHSS is reviewing this infant's medical and nitrate exposure histories and will prepare a case report describing the incident.

DHSS staff are listed on literature distributed by other agencies as resources for health risk information and handle several telephone calls each week answering questions about the health risks associated with consumption and household use of contaminated water. DHSS staff also present this information at public meetings approximately once a month.

For more information, contact Dr. Henry Anderson, DHSS, P. O. Box 309, Madison, Wisconsin, 53701-0309; phone: 608-266-1253.

## GEOLOGICAL AND NATURAL HISTORY SURVEY

The Geological and Natural History Survey (GNHS) performs basic and applied groundwater research and provides technical assistance, maps, and other information and education to aid in the management of groundwater resources. The GNHS groundwater program is complemented by geology, soils, and climate programs that provide maps and research-based information essential to

the understanding of groundwater occurrence, quality and movement. Survey personnel are presently preparing groundwater-related maps (such as water-table or aquifer maps) at a scale of 1:100,000 for the following counties: Racine, Kenosha, Grant, Waukesha, Dane, Ozaukee, Washington, Fond du Lac, La Crosse, Clark, Buffalo, Trempealeau, Pepin, Eau Claire, Wood, Polk, Burnett, St. Croix, Taylor, Oconto, and Lincoln.

In FY 1992, the GNHS responded to an increased number of requests for information and assistance from other local, state, and federal agencies, consultants, students, and the public. These requests ranged from the simple, "What will I find underground if I dig or drill here?" to the more complex, such as questions about groundwater flow and contaminant transport in areas of agricultural chemical use.

The public information, records, and research results that the GNHS stores and disseminates save the considerable expense of gathering the same geologic or groundwater information several times for different purposes, or "re-discovering" the same information over time. To help this service, the GNHS continues to review, sort and catalog about 12,000 well logs per year (in cooperation with the Department of Natural Resources), measure monthly groundwater levels in a monitoring network of 210 wells (in cooperation with the U. S. Geological Survey), collect and describe geologic samples from 300 wells per year, and collect and analyze approximately 600 groundwater samples per year for nitrate, chloride and several other basic parameters.

Research projects that have been completed this year or are in progress include the following:

- groundwater flow and quality in fractured dolomite in Door County;
- hydrogeologic and engineering properties of glacial materials;
- groundwater recharge in Central Wisconsin;
- age, origin and movement of groundwater in low-permeability materials;
- pesticides in groundwater near grade-A dairy farms in Western Dane County;
- detailed water-table map of upper Black Earth Creek and northern Dane County;
- impact of a barnyard run-off site on groundwater quality in Door County;
- delineation of hydrogeologic units throughout Wisconsin;
- extent of atrazine contamination in the Lower Wisconsin River valley;
- soils, geologic and hydrogeologic setting for atrazine movement in Dane County;
- evaluation of NURE hydrogeochemical data for use in Wisconsin groundwater studies;
- distribution of radionuclides in Wisconsin groundwater;
- delineation of potentiometric divide in the sandstone aquifer between the Wolf River and the Lower Fox River basins;
- delineation and characterization of the Platteville/Galena aquifer in southern Wisconsin;
- hydrogeology and groundwater use and quality of the Fox Cities area; and
- preliminary comparison of a discrete fracture model with a continuum model for groundwater movement for fractured dolomite.

For more information, contact Mr. Ron Hennings, WGNHS, 3817 Mineral Point Road, Madison, Wisconsin, 53705; phone: 608-263-7395. The appendix contains a listing of groundwater-related documents published by the GNHS during FY 92 and information on their availability.

## DEPARTMENT OF TRANSPORTATION

The Department of Transportation (DOT) regulates the storage of highway salt under ss. 85.17 and 85.18, Wis. Stats., for the purpose of protecting the waters of the state from harm due to contamination by dissolved chlorides.

Highway salt is stored at various sites by suppliers, counties, cities, villages and private companies. Annual inspections and reports are made of salt storage sites to insure that the piles are covered by buildings, structures, or other impermeable coverings as required by Chapter Trans 277, Wis. Adm. Code.

Current policy in the State Highway Maintenance Manual restricts the spreading of deicer salts to a maximum of 300 pounds per lane mile per application. Electronic controls for salt spreader trucks are being tested which give a more positive verification of the coverage. In addition, electronic controls will also record the exact amount spread at each location along the highway for better review and check.

County snowplow operators are given training and review of proper snowplowing and salt spreading techniques each fall. Counties furnish weekly reports of salt usage which are compiled for better regulation and control.

Over the past 20 years, studies have been conducted to monitor road salt and the impact on surface runoff, vegetation and soils by DOT's Geotechnical Engineering Unit. In the past 8 years, investigations were expanded to groundwater with a more recent emphasis on wetlands. Sampling has been done in several areas of the state to reduce variability due to climatic and geological factors.

As part of its road construction program, DOT performs an estimated 500 environmental assessments annually in its right of way where potential sources of contamination are identified. DOT works with the DNR on 50 to 100 sites per year where tank removal or other remedial action is necessary to accomplish highway improvement.

During the past two years, DOT has engaged in a cooperative study with the U. S. Geological Survey to investigate groundwater relationships with respect to wetland creation and restoration projects. These projects are required as compensatory mitigation under section 404 of the Clean Water Act. The groundwater studies are intended to increase the certainty of establishing wetland hydrology.

For more information, contact Ms. Carol Cutshall, DOT, P. O. Box 7911, Madison, Wisconsin 53707-7911; phone: 608-266-9626.

## UNIVERSITY OF WISCONSIN SYSTEM

The University of Wisconsin System (UWS) has research, teaching and information/education responsibilities. The three missions are well integrated through the cooperation and joint appointments of teaching, research and extension personnel who work on groundwater issues.

Research - During FY 1992 the UWS has conducted a broad-based program of priority groundwater research consisting of thirteen projects. These projects are of both a fundamental and applied nature and can be of long or short duration. They provided a balanced program of laboratory, field and

computer simulation projects with an effort to establish whether laboratory experiments are capable of predicting conditions in the natural environment. Among the categories of groundwater problems which have been investigated are:

- a. Contaminant transport in soils and their dispersion in aquifers.
- b. Occurrence of pesticides and their metabolites in groundwater and their probable sources.
- c. Improved management of agricultural chemicals, particularly pesticides and nitrates.
- d. Hydrogeologic field measurements and computer simulations.
- e. Remediation of contaminated waters and the economics of alternative technologies.
- f. Attenuation of volatile organic compounds (VOCS).
- g. Characterization of the subsurface zones of soil.
- h. Measuring biological effects of groundwater contaminants.

The thirteen projects funded in the above categories provided training for three postdoctoral research associates and sixteen graduate student research assistants. As many as thirty undergraduate students also received training and funding on an hourly basis. A comprehensive list of the funded projects and their respective principal investigators is be found in Table 1.

Teaching - The UWS institutions continue to offer courses and/or programs at the undergraduate and/or graduate level which focus on the conservation of our groundwater resources. In addition, several campuses offer credit, field-oriented water curriculum courses for middle school and high school teachers during the summer sessions.

Information/Education - The UW System institutions and county-based staff continue involvement in groundwater education activities. In cooperation with other state and federal agencies, groups and individuals, innovative problem-solving educational programs on groundwater resources are provided to the State's citizens through publications, meetings, teleconferences, satellite, water testing and other forms of assistance.

The UWS farmstead assessment system (Farm\*A\*Syst) which helps farmers assess the relationship of their farmstead structures, management practices and site characteristics to groundwater pollution potential, has been applied in depth in several Wisconsin counties. A pollution prevention delivery system based on farmstead assessment is being developed in cooperation with farm supply groups and other agribusinesses. The expanded, national project is already working with forty-one other states which are interested in adapting this system. This is an EPA-U. S. Soil Conservation Service-Cooperative Extension Service cooperative project.

The U. S. Department of Agriculture (USDA) Water Quality Demonstration Project in the East River Watershed (Green Bay) is increasing adoption of research-based practices for cost-effective protection of water quality. This year's educational program emphasis has been on manure handling,

integrated crop management, fuel and pesticide storage, milkhouse wastes, and sealing of unused wells.

The USDA Hydrologic Unit project in Portage County is applying research on flow systems and land use/water quality relationships to the protection of water quality in a municipal water supply aquifer. Urban, suburban and rural components are all considered in demonstration and educational work. These USDA projects are joint efforts of the county, state and federal agencies.

The UWS Nutrient and Pest Management (NPM) Program is engaged in fifty on-farm demonstration and field day activities to disseminate information on best management practices (BMPs) around the state. The program is working toward whole-frame integrated management systems as it continues to complete its complement of regional staff. A new publication, "The Bottom Line", emphasizes the economic aspects of NPM and its relationship to groundwater quality.

The UWS cooperates with other state agencies on the Non-point Source Water Pollution Abatement Program. This program works to improve water quality in watersheds by providing educational and/or technical assistance and cost-sharing for BMPs to improve water quality. The program has grown to over fifty-six watersheds. Groundwater quality has been an increasing focus of this program with two watershed projects specifically targeting groundwater protection as a primary goal, and several projects now incorporating groundwater education into their overall information and educational strategies. The UW Extension Area Water Quality Information and Education program expanded into southern Wisconsin by hiring and locating a specialist at UW-Madison. The six specialists offer groundwater education which includes drinking water testing programs, drinking water fact sheets, newsletter articles about groundwater and, in some instances, specific watershed studies that address unique water quality problems (e.g., elevated levels of lead and arsenic in drinking water in samples from Door County wells).

To address issues related to water resources, Extension formed the Extension Water Resources Coordinating Council (EWRCC). Professional support staff was hired and projects were initiated that address: 1) maintaining an inventory of water-related programs and research, 2) enhancing internal communication, 3) assisting in priority-setting, and 4) facilitating external coordination.

Local governmental educational and technical assistance is provided by the Central Wisconsin Groundwater Center. Drinking water quality interpretations were provided to over one thousand citizens. The Center also worked with DNR in promoting wellhead protection and non-point groundwater pollution efforts. An outreach and technical assistance program specifically for Native American tribal units is also underway.

For more information, contact Dr. Earl Peace, UW System, 1220 Linden Drive, Madison, Wisconsin, 53706; phone: 608-262-5851. The appendix contains a listing of groundwater-related documents published by the UWS during FY 92 and information on their availability.





## GROUNDWATER MONITORING AND RESEARCH

### CONDITION OF THE RESOURCE - GROUNDWATER QUALITY

As part of 1983 Wisconsin Act 410, the Groundwater Account of the Environmental Fund was created to support groundwater monitoring by state agencies to determine the extent of groundwater contamination in Wisconsin and identify the sources of contamination. Groundwater monitoring has found that the primary contaminants of concern are volatile organic chemicals (VOCs), pesticides and nitrates. Each is discussed below.

Volatile Organic Chemicals - Volatile organic chemicals (VOCs) vaporize under normal temperatures and pressures. Examples of VOCs include gasoline and industrial solvents, household products such as spot and stain removers, paints and thinners, drain cleaners, and air fresheners. Many VOCs are suspected carcinogens if exposure to them is long term. In the short term, high concentrations of VOCs can cause nausea, dizziness, tremors, or other health problems.

To date, the Department of Natural Resources has sampled over 6,000 wells for VOCs. Fifty four different VOCs have been found in Wisconsin groundwater. Trichloroethylene is the VOC most often detected at levels exceeding groundwater enforcement standards. VOC monitoring results from the DNR's groundwater information network (GIN) are summarized in the appendix. Groundwater standards have been adopted for 35 VOCs.

VOCs can disperse quickly in groundwater and often spread over large distances. Therefore, when various VOC sources are present in an area, it is often difficult to identify the specific source of contamination. The major VOC sources, where sources could be identified or tentatively pinpointed, are leaking underground gasoline storage tanks, landfills, and hazardous waste storage and handling facilities. A two-year study of VOC contamination at 26 Wisconsin landfills found VOC contamination at older sites which are not engineered to present design standards. VOCs were detected at 12 of the 26 landfills, with 1,1-dichloroethane being found most often. The Department's Bureau of Solid and Hazardous Waste Management Report entitled "VOC Contamination at Selected Landfills - Sampling Results and Policy Implications", dated June 1989, summarizes these results.

Wisconsin requires underground storage tanks to be registered if their capacity is greater than or equal to 60 gallons. This registration program has identified 139,000 tanks in the state of which 126,153 are presently in use. Approximately 53,000 of these tanks will be regulated by the federal underground storage tank program. The contaminants most commonly associated with leaking underground petroleum storage tanks are benzene, xylene, toluene and ethyl benzene.

Section 144.76, Wis. Stats., the Hazardous Substances Spill Law, became effective in 1978. The law required those who spill hazardous substances to report spills and to take actions necessary to restore the environment. The number of reported spills has increased from 360 in 1978 to 1081 in 1990. Petroleum products comprise 65 percent of all reported spills in Wisconsin.

Pesticides - Pesticides were first found to be a problem in Wisconsin when aldicarb was detected in groundwater near Stevens Point in 1980. Although the amount of aldicarb being applied to potatoes in Wisconsin has declined dramatically, it is still detected in the groundwater of the central sands portion of Wisconsin. Approximately one-quarter of the wells which have been sampled show

detectable levels of aldicarb.

The pesticide sampling program was expanded in 1983 to sample for various pesticides (in addition to aldicarb) used in Wisconsin. Pesticides can reach groundwater as a result of normal application practices (nonpoint sources) or as a result of spills, waste disposal and improper storage practices (point sources). The pesticides tested for and detected in groundwater since 1983 are identified in the appendix. Groundwater quality standards have been adopted for 30 pesticides.

A significant problem identified through pesticide sampling is groundwater contamination related to the handling and storage of pesticides. Over 30 sites in Wisconsin have been identified where the improper handling of pesticides has contaminated groundwater. To address this problem, the DNR and the Department of Agriculture, Trade and Consumer Protection (DATCP) initiated a study of 28 pesticide mixing/loading facilities in 1990 to investigate the extent of the problem. The study, completed in the fall of 1991, indicated that soil and groundwater contamination is common at agricultural facilities in Wisconsin. Soils at 25 of 27 sites contained pesticides. Groundwater samples from 15 sites contained pesticides and 9 had pesticide levels in groundwater above the state's enforcement standards. Nitrates were found in groundwater at 15 of the sites and seven of these had nitrate levels above the enforcement standard. This study is discussed in "Report on Wisconsin Pesticide Mixing and Loading Site Study", published by the DNR and DATCP in October of 1991.

DATCP has initiated several studies to investigate pesticides in groundwater. Beginning in 1985, DATCP installed monitoring wells at nearly 50 farm fields in susceptible geologic environments to determine the impact of pesticide use on groundwater. To date, the herbicide atrazine has been found at 25 of 35 sites and the herbicide alachlor (trade name Lasso) has been found at 7 of 23 sites at which they have been used. Recent sampling for atrazine metabolites or breakdown products revealed one or more detects of metabolites in 76 wells at 31 sites. Forty seven wells had a metabolite finding along with parent atrazine and 29 wells contained only a metabolite. Eleven of the sites have at least one well with concentrations of atrazine plus metabolites which exceed 3 micrograms per liter (ug/l).

DATCP randomly sampled well water on 534 Grade A dairy farms between August, 1988 and February, 1989 to determine the extent of pesticide contamination. Grade A dairy farms were sampled due to access and regulatory authority considerations. Water samples were analyzed for 44 pesticides and nitrates. A total of 71 wells (13%) contained one or more pesticides. Atrazine was found alone or in combination in 66 wells (12%). In 39 of the 534 wells (7 %) the concentration of atrazine was above its preventive action limit (PAL) of 0.35 ug/l, and in 3 of these it was over its enforcement standard (ES) of 3.5 ug/l. Alachlor exceeded its enforcement standard of 0.5 ug/l in all 5 wells where it was found. The April, 1989 DATCP report "Grade A Dairy Farm Water Well Survey" provides a summary of this pesticide and nitrate sampling effort.

Two studies have been completed during the past year as a follow-up to the Grade A dairy survey. First, DNR staff resampled 69 of the 71 wells which showed detectable concentrations of one or more pesticides. Nearby private wells were also sampled to determine the extent of pesticide occurrence associated with the original detects. Fifty seven of the 69 wells still contained a detectable concentration of at least one pesticide. Atrazine remained the most prevalent pesticide, found alone in 50 wells and in combination with alachlor, metolachlor or cyanazine in 6 wells.

A total of 212 nearby wells were also sampled. Pesticides were detected in 63 (30%) of these wells.

Atrazine was the most frequently detected pesticide and was found alone in 57 of the wells and with one or more other pesticides in the remaining six impacted wells. As anticipated, these wells were more frequently contaminated than the statewide proportion estimates calculated from the original Grade A dairy survey. The results of the follow up study are summarized in the DNR report, "Follow Up to the Grade A Dairy Farm Well Water Quality Survey published in February of 1992.

Second, DATCP, DNR and the CIBA-GEIGY Corporation initiated a rural well sampling program to get a better understanding of pesticides and nitrates in groundwater in rural portions of Wisconsin. A special analytical procedure was used to screen for the presence of triazine-class pesticides, of which atrazine is the most prominent member. 2,187 rural wells were sampled at a cost of \$16 to the homeowner.

Final results show that 16 percent (351 of 2,187) well tests contained detectable concentrations of triazine-class compounds. 159 of the 351 wells (45%) with triazine detects had concentrations at or above 0.35 ug/l (the preventive action limit for atrazine). Thirty-two percent of the wells sampled in Dane County (84 of 263 sample analyses) had triazine detects.

Any well with a concentration of triazines at or above 0.35 ug/l or nitrates above 10 milligrams/liter was resampled by the DATCP and DNR for a more complete list of pesticides. The results show 51 percent (221 of 436) of the resampled wells have detectable concentrations of one or more pesticides, predominantly atrazine (216 of 221).

Since the triazine test is conservative, the number of followup samples above the atrazine PAL can be compared to the total number of screened samples. Therefore, 6 % (122 of 2187) of the wells in the survey contain atrazine above the PAL, and 0.5 % (11 of 2187) are above the enforcement standard. The pesticides detected besides atrazine were alachlor (11 detects), metolachlor (6), cyanazine (2) and metribuzin (4).

In January of 1991, the State Laboratory of Hygiene (SLOH) began offering a triazine screening test for the public. For \$17, the SLOH will analyze a water sample for triazines. The DNR provides assistance to those who have triazine concentrations greater than 3 ug/l.

Samples were collected and analyzed for triazines from eight priority watersheds as part of the joint DNR-DATCP nonpoint source program. Of 1,220 samples analyzed, 16 wells (1.3 %) exceeded the ES for atrazine plus metabolites; 157 (12.8%) exceeded the PAL. The mean concentration was 0.3 ug/l.

Until March of 1992, only 2 atrazine metabolites or breakdown products had been detected in groundwater in Wisconsin - deethylatrazine and deisopropylatrazine. Deethylatrazine was generally found with parent atrazine and sometimes by itself. Deisopropylatrazine was found less frequently, normally together with parent atrazine. Deethylatrazine was normally found at about the same concentration as parent atrazine, and occasionally was even higher than parent atrazine. In response to these findings, a groundwater standard for total chlorinated atrazine residues to include parent atrazine and metabolites of health concern was adopted in February of 1992. The new enforcement standard is 3.0 ug/l for the sum of atrazine and its three chlorinated metabolites (deethylatrazine, deisopropylatrazine and diaminoatrazine). The new PAL is 0.3 ug/l.

As part of the Rural Well Survey, CIBA-GEIGY Corporation received a split sample from each of

the 236 followup wells that had a value at or above 0.35 ug/l from the triazine test. CIBA-GEIGY analyzed these samples for parent atrazine and all the chlorinated metabolites, deethyl- atrazine (DEA), deisopropylatrazine (DIA), and diaminoatrazine (DAA). Results from this phase of the Rural Well Survey were received by DATCP in March of 1992. These are the first data on the presence of diaminoatrazine in Wisconsin groundwater. Eighty-five percent (200 of 236) of the wells contained atrazine, 88% (208 of 236) contained DEA, 61% (143 of 236) contained DIA, and, surprisingly, 83% (195 of 236) contained DAA. Average concentrations (including non-detects) were 0.90, 0.71, 0.27, and 0.86 ug/l for atrazine, DEA, DIA, and DAA, respectively.

The addition of the diaminoatrazine metabolite to the total chlorinated residues from the 236 samples analyzed by CIBA-GEIGY increased the number of samples at or above the PAL (0.30 ug/l) from 197 to 208. More importantly, the number at or above the ES (3.0 ug/l) increased from 45 to 71. Comparing these to the 2187 samples screened in the Rural Well Survey, 9.5% (208 of 2187) exceed the PAL and 3.2% exceed the ES. It is interesting to note that the Grade A survey estimated that between 5 and 9% of wells on Grade A dairy farms contain parent atrazine at or above the PAL for parent atrazine (0.35 ug/l) which was in place in 1988.

Nitrates - Nitrate is the most commonly found groundwater contaminant, and frequently exceeds the state drinking water standard and enforcement standard (ES) of 10 milligrams/liter (mg/l). Consumption of water containing high concentrations of nitrate or nitrite can induce methemoglobinemia, a condition in which hemoglobin is oxidized to a form which is unable to carry oxygen to the body's tissues. Clinical methemoglobinemia in infants has occurred following ingestion of water containing nitrate concentrations as low as 50 mg/l (11 mg/l nitrate-nitrogen)(Fan, Willhite and Book, 1987, Evaluation of the Nitrate Drinking Water Standard with Reference to Infant Methemoglobinemia and Potential Reproductive Toxicity, Jour. of Regulatory Toxicology and Pharmacology, vol. 7, p. 135-148; Drinking Water and Health, 1977, v. 1, p. 417, National Research Council). Fatal poisonings usually involve ingestion of water containing 100-150 mg/l nitrate (Johnson and Kross, 1990, Continuing Importance of Nitrate Contamination of Groundwater and Wells in Rural Areas, Amer. Jour. of Industrial Medicine, vol. 18, p. 449-456.). The long-term effects of chronic nitrate exposure on human growth, development and general health ingesting lower concentrations are not known.

While agricultural activities are the most significant sources of nitrates, other sources include septic tanks and industrial/municipal wastewater, sludge and refuse disposal areas.

County groundwater assessments conducted by the Wisconsin Geological and Natural History Survey, the Central Wisconsin Groundwater Center, and the University of Wisconsin-Extension Environmental Resources Center have found that approximately 10% of the private water supply wells in the state contain nitrate-nitrogen above 10 mg/l. This percentage was confirmed by the nitrate sampling done in conjunction with the DATCP Grade A Dairy Farm Well Water Quality Survey. The sampling found nitrate-nitrogen concentrations above the preventive action limit (PAL) of 2 mg/l in 255 wells (48%) and over the ES of 10 mg/l in 55 (10%) of these wells. Pesticides were found in 28 (52%) of the 55 wells with nitrate-nitrogen over the 10 mg/l ES.

As a follow up to the Grade A Dairy well survey, the DNR sampled 69 of the 71 wells with pesticide detects and 212 nearby wells. Thirty two of the 69 wells (46%) and 62 of the 212 nearby wells contained nitrate concentrations above 10 mg/l.

Private wells were sampled in eight new priority watersheds in FY 92 as part of the state's nonpoint

source program. Of 1,317 samples analyzed for nitrates, 216 (16.4%) wells exceeded the ES for Nitrate+Nitrite; 565 (42.9%) exceeded the PAL.

Based on the results of these and other studies, we estimate that at least 10% or 70,000 of Wisconsin's 700,000 domestic wells exceed the standard of 10 mg/1 of nitrate - nitrogen. Because of the concern with nitrates, the Groundwater Coordinating Council endorsed a resolution in 1989 recommending that newly constructed water supply wells be sampled for nitrates as well as coliform bacteria.

## CONDITION OF THE RESOURCE - GROUNDWATER QUANTITY

During the drought of 1988-89 and the dry spring of 1992, Wisconsin residents have been concerned about the possibility of diminishing groundwater supplies. Wisconsin has an abundance of groundwater of good quality in most of the state except in a part of north-central Wisconsin underlain by poorly productive, fractured crystalline rocks (see Figure 1). In this area, yields of groundwater during dry seasons are too low in some places to sustain large water supplies. However, yields adequate for domestic wells can usually be found.

Despite the growing demand, the overall supply of groundwater is more than adequate to meet foreseeable needs of the state. More than one million billion gallons of water is estimated to be stored underground in Wisconsin. At current pumping rates for private, municipal, industrial and agricultural uses, groundwater in storage would last more than 5000 years without replenishment. However, replenishment of groundwater occurs constantly.

For all practical purposes, the total amount of water available in Wisconsin remains essentially the same as it was more than one hundred years ago. Groundwater is being constantly replenished by precipitation, which brings annually about 31 inches of water to the surface area of the state. Of this amount, almost 10 inches enters streams and eventually flows out of the state. Of this 10 inches per year, or 30 billion gallons of water per day, that flows out of Wisconsin, between 15 and 20 billion gallons is contributed by groundwater. The rest returns to the atmosphere by evaporation and transpiration.

The occurrence and availability of groundwater differs considerably from area to area, depending on the character and thickness of water-bearing rocks and their connection with underlying and overlying rocks, soil and surface water. The rate of groundwater recharge varies correspondingly, from close to zero in parts of eastern Wisconsin, where there are mainly impermeable soils, to perhaps as much as 50 percent of annual precipitation in the central portions of the state where sandy glacial deposits cover the surface.

If we assume that, on average, about 15 percent of annual precipitation reaches the water table, approximately 14 billion gallons of water is recharged to groundwater every day. This is enough to fill Lake Winnebago 600 times each year. Estimated daily use of groundwater in Wisconsin is about 600 million gallons, which represents only 4 percent of daily groundwater recharge.

Despite this general abundance of groundwater, water levels are declining slowly in local areas of concentrated pumping, primarily in southeastern Wisconsin and the Lower Fox River valley (see Figure 1). Fortunately, the declines thus far have been primarily in artesian pressure, resulting in increased costs of pumping but not in dewatering of aquifers. Management options to maintain an adequate groundwater supply are being considered in most of these areas.

Effective management of groundwater in Wisconsin requires up-to-date information on groundwater levels and their fluctuations and trends. The WGNHS and the U. S. Geological Survey initiated a statewide water-level observation network already in 1946. Water-level measurements are checked and entered into a computer data base. During 1991, systematic observations of water levels were made on 196 wells. Statewide summaries of groundwater level trends are published annually or biennially.

A computer program for retrieval of water-level data was developed and a Groundwater Data County Series initiated in 1990. A format for groundwater data sheets was developed in 1991 and tested on the record of observation wells in Dane County. The first page contains station history, which includes well number and location, well construction and observation information, and length of record. The second page contains the water-level record including average monthly and annual levels and maximum and minimum levels for each year on record.

Recently, groundwater levels were significantly affected by the 1988-89 drought. Water levels in many Wisconsin wells were lowered, primarily in southern and eastern Wisconsin. During 1990, the water levels began to recover. The recovery continued in 1991 when the water levels rose again above normal, with the exception of parts of southwestern, south-central and northeastern Wisconsin.

More attention is being paid to the connection between ground and surface water. In 1991, the WGNHS began a study of the interrelationship of ground and surface water in the Black Earth Creek basin, with plans to extend it to all of Dane County. The purpose of the study is to investigate the effects of groundwater withdrawals on surface water. For example, how much does the pumping of groundwater reduce the base flow in Black Earth Creek or to the Lake Wingra wetlands? Results of the study will be applicable to similar drainage basins in Wisconsin.

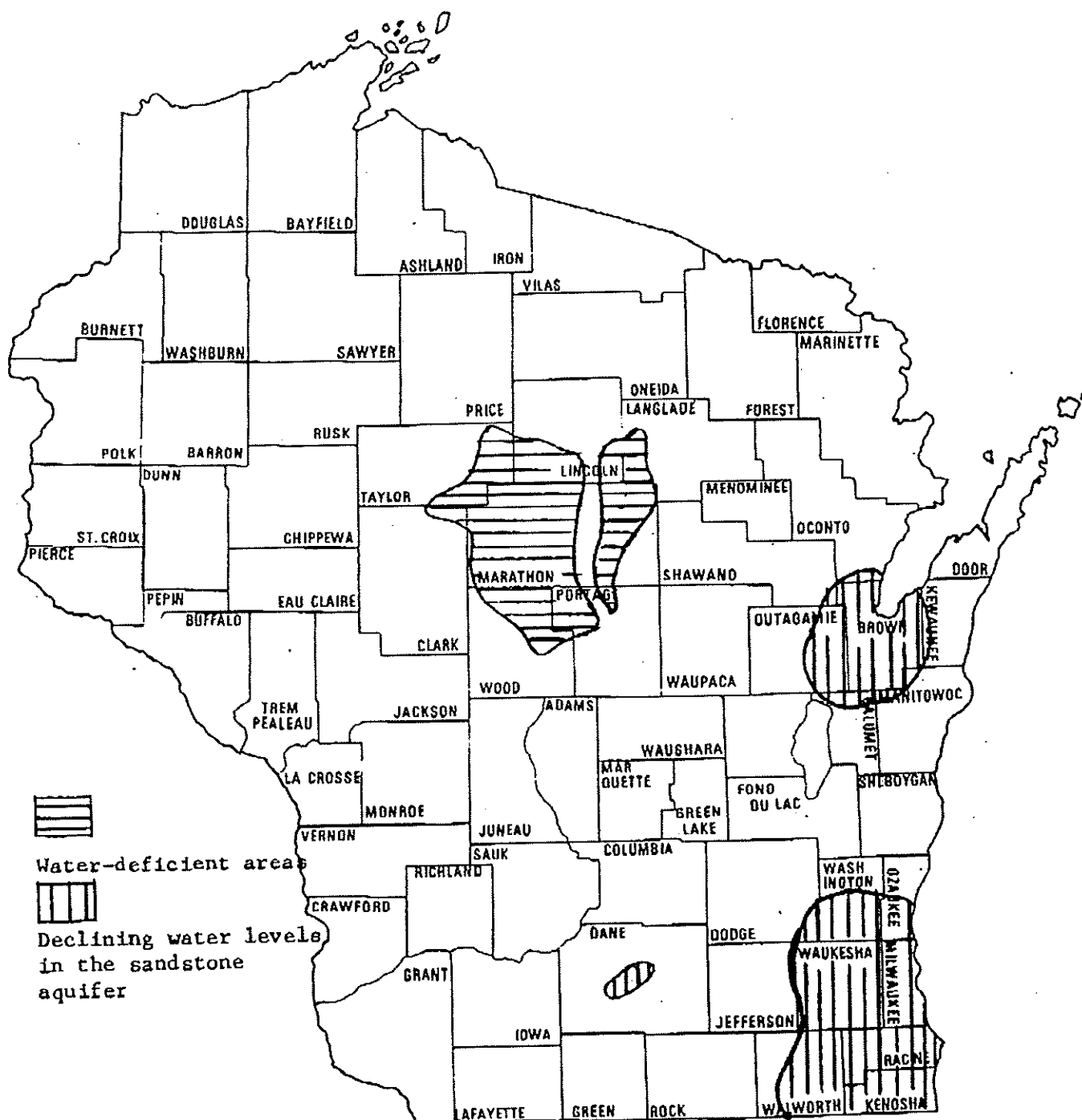


Figure 1 - Map showing generalized areas of water-deficiency and declining water levels  
(Source: WGNHS files)



## COORDINATION OF GROUNDWATER MONITORING AND RESEARCH

Four state agencies have approximately \$825,000 available each year for groundwater-related monitoring or research. The purposes and sources of money include:

1. DNR Management Practice Monitoring - The Department of Natural Resources has approximately \$350,000 available each year to support groundwater monitoring studies evaluating existing design and/or management practices associated with potential sources of groundwater contamination. The intent of these studies is to reduce the impacts of potential sources of contamination by changing the way land activities which may impact groundwater are conducted.
2. DATCP Pesticide Research - Since 1989, the Department of Agriculture, Trade and Consumer Protection has had approximately \$125,000 available annually through fees from pesticide manufacturers as a result of the pesticide law to fund research on pesticide issues of regulatory importance.
3. UWS Groundwater Research - \$300,000 is available annually for groundwater research administered by the University of Wisconsin System (UWS).
4. DILHR Septic System Research - The Department of Industry, Labor and Human Relations has received an appropriation of \$50,000 for four years to fund research on alternatives to current septic system technology. The research, which will include groundwater monitoring, focuses on designs, products, and management practices that minimize nitrate contributions from septic systems.

In order to provide consistency and coordination among the four state agencies (DATCP, DNR, DILHR and UWS) in funding groundwater monitoring and research to meet state agency needs, there have been discussions among the involved agencies through the Groundwater Coordinating Council (GCC) for some time. At the request of the GCC, the UWS in 1988 created a Groundwater Research Advisory Council (GRAC) to establish a long-range groundwater research plan and develop a groundwater research decision item narrative (DIN) for inclusion in the University's biennial budget. The GRAC consists of university, state agency and public representatives.

Based on discussions with the GCC, the GRAC prepared a groundwater research decision item narrative (DIN) for inclusion in the University's 1990-1992 biennial budget request. The GCC endorsed the DIN at its October 14, 1988 meeting. The DIN was included in the governor's budget and was approved by the Legislature at a level of \$500,000 for the 1989-1991 biennium for groundwater research. This amount was increased to \$600,000 for the 1991-1993 biennial budget. Statutory language requires that there be agreement between the UWS and the GCC on the use of the UWS research funds before the funds can be released by the Department of Administration. To expedite this agreement, a Memorandum of Understanding (MOU) was signed in 1989 by representatives of the GCC, the GRAC and the UWS on use of the UWS groundwater research funds. The MOU spells out the procedures for establishing priorities and selection of projects for funding of UW groundwater research. The MOU recognizes that the GCC has a substantive role in establishing research priorities and an advisory role in project selection to minimize overlap and duplication.

The UWS funded 19 groundwater research proposals during the 1989-91 biennium with concurrence from the GCC. The results of those studies were published in October, 1991 by the UW Water Resources Center in a report titled, "UWS Ground Water Research Program, Summary of 21 Projects".

During the summer of 1990, the GRAC and GCC developed and endorsed a plan to coordinate the solicitation of funds in fiscal year (FY) 1992 and future years. The mechanism provides for only one submittal of project proposals, rather than four as has been the case. The intent of the plan is to determine the most appropriate funding source for funding a particular project.

The plan was initiated in the fall of 1990 to solicit project proposals for funding beginning in fiscal year 1992. A total of 47 proposals were received for review. The MOU was followed in the project solicitation, review and selection process for UWS proposals. Twenty eight projects were selected for funding and are listed in Table 1. The locations of the field sites for the projects funded are shown on Figure 2. The numbers on the map correspond to the numbers of the projects listed in Table 1. Some projects have more than one field site. Those projects without a number in Table 1 are laboratory studies that don't have a field site or projects which cover an area larger than a county. The locations of 4 studies funded by the DNR separately from the joint solicitation are also included in Figure 2. They were on-going studies that had been funded in previous years.

The same process was followed in the fall of 1991 to solicit and select new proposals for funding in FY 1993. Because 16 of the projects funded in FY 1992 are two-year studies requiring funding in FY 1993, less money was available for new projects in FY 1993. DILHR had already committed its FY 1993 funding. The joint solicitation was sent out in November. A copy of the joint solicitation is contained in the appendix of this report. Twenty seven proposals were received for consideration. In addition to review by each agency, the GCC Research and Monitoring & Data Management Subcommittees met jointly in February to discuss and provide ratings for the proposals. Representatives of the agencies met in March to discuss funding of projects which ranked high by more than one agency. Twelve new projects were chosen for funding in FY 1993 and are listed in Table 2 along with the continuing projects. Sixteen projects to be funded this year will be continuing projects funded in FY 92; those projects are starred in Table 2.

In order to comply with statutory language, the GCC met via a teleconference on April 10, 1992 and approved the UWS proposed groundwater research plan to fund 6 new and 8 continuing projects. Secretary of Administration James Klauser was notified of the GCC action so that the UWS funds for groundwater research in FY 93 could be released.

Table 1 - Groundwater Projects Funded Through the Joint Solicitation for FY 1992

New projects funded by the DNR

1. Remediation of Soils Contaminated by Leaking Underground Storage Tanks by Vapor Extraction and in situ Biostimulation. Hickey and Bubenzer. \$22,666
2. Evaluation of Denitrification Systems for Improving Groundwater Quality from On-site Waste Disposal Systems. Shaw, Schmidt and Kaminski. \$29,044
3. Municipal Wastewater Absorption Pond Renovation for Enhanced Nitrogen Removal. Gilbert and Oman. \$37,700
4. Investigation of Potential Groundwater Impacts at Demolition Landfills, Deer Pits and Yard Waste Compost Sites. Connelly. \$23,216
5. Arsenic as a Naturally Elevated Parameter in Water Supply Wells in Eastern Winnebago and Outagamie Counties, Wisconsin. Stoll. \$23,039
6. Spatial Attributes of the Soil-Landscape Groundwater System of the Lower Wisconsin River Valley. McSweeney, Madison, Attig and Bohn. \$22,918
7. Preliminary Comparison of a Discrete Fracture Model with a Continuum Model for Groundwater Movement for Fractured Dolomite. Bradbury and Muldoon. \$8,880

Evaluation of NURE Hydrogeochemical Data for Use in Wisconsin Groundwater Studies. Mudrey, Bradbury and Kammerer. \$14,760

Distribution of Radionuclides in Wisconsin Groundwater. Mudrey, Bradbury and Fitzgerald. \$5,000

8. Variability of Hydrologic Conductivity in the Horicon Formation: The Effects of Scale and Testing Methods in a Uniform Media. Mickelson and Bradbury. \$9,656
9. Evaluations of Barnyard Improvements on Groundwater Quality. Shaw. \$10,456

Assessing the WDNR's Program for Monitoring Active Non-Approved Landfills. Gear. \$5,217

10. GIS Mapping of Groundwater Contaminant Sources Quality and Contamination Susceptibility for Door County. Stoll. \$34,369

Projects funded by the UWS

Use of Tire Chips to Attenuate VOCs. Edil and Park. \$25,030

Effects of Complex Leachate Mixtures on the Transport of Hydrophobic Organic Pollutants. Grundl, Cherkauer and Edgington. \$20,605

Role of Mobile Colloids in Groundwater Contaminant Transport. Armstrong. \$32,665

11. Tracking Contaminant Pathways in Groundwater with a Geologically Based Computer Model

for Outwash Deposits. Mickelson. \$28,975

12. Effects of Transient, Cross-stratification Flow on Contaminant Dispersion. Bahr. \$24,160

The Convective Flux of Chemicals Across a Sediment-Water Interface. Green. \$18,420

Near Source Transport of Contaminants in Heterogeneous Media. Hoopes. \$35,820

13. Living Mulch Systems for Nitrate Trapping in Vegetable Production. Harrison. \$24,260

Geographical Information System for Subsurface Characterization. Bosscher, Adams and Joeres. \$24,025

New Approaches to Measuring Biologic Effects of Groundwater Contaminants. Porter, Carlson, Hinsdill, Olson and Weiler. \$15,000

Projects funded jointly by UWS and DATCP

14. Herbicide and Nitrate Movement in a Sandy Soil in the Lower Wisconsin River Valley. Lowery, McSweeney and Stoltenberg. \$45,000

15. Estimating the Spatial Distribution of Groundwater Recharge Rates Using Hydrologic, Hydrogeologic and Geochemical Methods. Potter, Bowser and Bradbury. \$37,365

16. Distribution, Transport and Fate of Major Herbicides and Their Metabolites. Chesters and Harkin. \$68,675

Project funded jointly by DNR and DATCP

17. Dane County Atrazine/Land Management Project. Conners, Bohn and Ventura. \$38,600

Project funded by DILHR

18. Nitrogen Removal from Domestic Wastewater in Unsewered Areas. Otis, Boyle and Converse. \$93,000

Continuing projects funded by DNR

19. Pesticide Impacts on Groundwater. Postle. \$6,800

20. Waupaca County Groundwater Project. Wilson. \$7,750

21. Crop Rotations Effects on Leaching Potential and Groundwater Quality. Posner. \$14,500

22. A Comparative Study of Nitrate Loading to Groundwater from Mound, In-Ground Pressure and At-Grade Septic Systems. Shaw. \$22,600

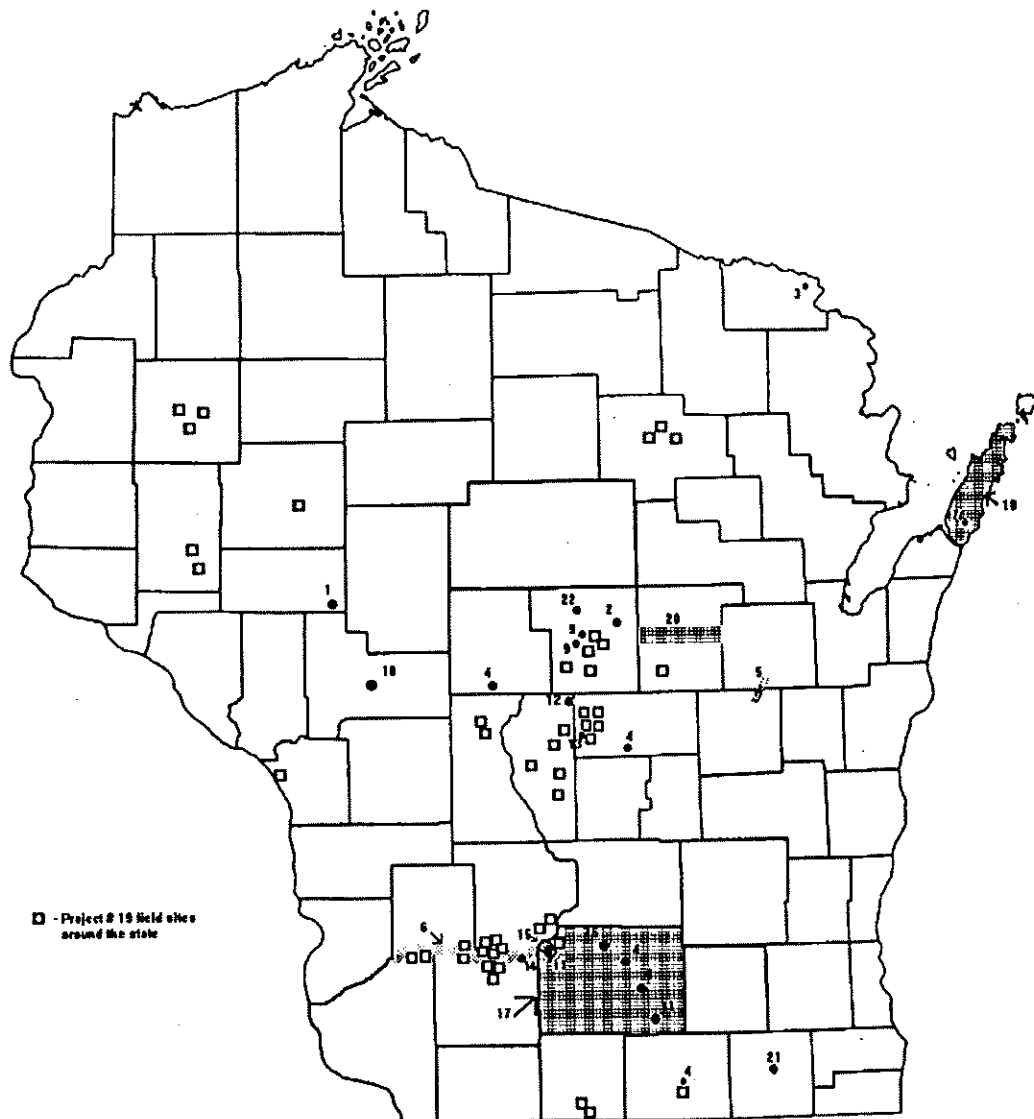


Figure 2 - Location of groundwater monitoring  
 or research studies for F.Y. 1992

Table 2 - Groundwater Projects Funded Through  
the Joint Solicitation for FY 1993

Projects funded by the DNR

Evaluation of Five Groundwater Susceptibility Assessment Systems in Dane County, Wisconsin. Bohn, Muldoon, Madison, Bradbury, Zaporozec and Postle. \$37,570

Tracer Study for Characterization of Groundwater Movement and Contaminant Transport in Fractured Dolomite. Bradbury and Muldoon. \$19,400

Long-Term Transformations and Fate of Nitrogen with Mound Type Soil Absorption Systems for Septic Tank Effluent. Harkin, Duffy, Rockweiler and MacCubbin. \$24,363

Urban Stormwater Infiltration: Assessment and Enhancement of Pollutant Removal. Armstrong. \$22,100

A Further Study of Organics at Wisconsin Municipal Solid Waste Landfills. Connelly. \$21,632

\*Remediation of Soils Contaminated by Leaking Underground Storage Tanks by Vapor Extraction and in situ Biostimulation. Hickey and Bubenzer. \$35,437

\*Evaluation of Denitrification Systems for Improving Groundwater Quality from On-site Waste Disposal Systems. Shaw, Schmidt and Kaminski. \$20,236

\*Municipal Wastewater Absorption Pond Renovation for Enhanced Nitrogen Removal. Gilbert and Oman. \$11,800

\*Investigation of Potential Groundwater Impacts at Demolition Landfills, Deer Pits and Yard Waste Compost Sites. Connelly. \$40,397

\*Spatial Attributes of the Soil-Landscape Groundwater System of the Lower Wisconsin River Valley. McSweeney, Madison, Attig and Bohn. \$20,533

\*GIS Mapping of Groundwater Contaminant Sources Quality and Contamination Susceptibility for Door County. Stoll. \$26,369

\*Pesticide Impacts on Groundwater. Postle. \$11,800

Projects funded by the UWS

Trace Metal Transport Affected by Groundwater/Stream Interactions. Bahr. \$17,000

Management of Sweet Corn Processing Wastes to Protect Groundwater Quality. Bundy. \$19,000

Variability of Hydraulic Conductivity in Supraglacial Sediments. Mickelson. \$28,000

Field Evaluation of Near Source Transport of Contaminants in Heterogeneous Media. Hoopes.

\$26,000

Ultrasonic Verification Technique for Evaluating Well Seals. Edil and Benson. \$20,000

Impact of Tunnel Dewatering on Surface Water Bodies in Milwaukee County. Cherkauer. \$28,000

\*Use of Tire Chips to Attenuate VOCs. Edil and Park. \$23,000

\*Role of Mobile Colloids in Groundwater Contaminant Transport. Armstrong. \$27,665

\*Effects of Transient, Cross-stratification Flow on Contaminant Dispersion. Bahr. \$13,000

\*Living Mulch Systems for Nitrate Trapping in Vegetable Production. Harrison. \$26,000

\*Geographical Information System for Subsurface Characterization. Bosscher, Adams and Joeres. \$24,000

Projects funded jointly by UWS and DATCP

\*Herbicide and Nitrate Movement in a Sandy Soil in the Lower Wisconsin River Valley. Lowery, McSweeney and Stoltenberg. \$45,000

\*Estimating the Spatial Distribution of Groundwater Recharge Rates Using Hydrologic, Hydrogeologic and Geochemical Methods. Potter, Bowser and Bradbury. \$37,365

\*Distribution, Transport and Fate of Major Herbicides and Their Metabolites. Chesters and Harkin. \$68,675

Project funded by DATCP

Atrazine Management and Weed Control Strategies in Wisconsin Corn Production. Nowak \$22,000

Project funded by DILHR

\*Nitrogen Removal from Domestic Wastewater in Unsewered Areas. Otis, Boyle and Converse. \$93,000

Projects preceded by an \* are projects which were also funded in FY 1992.

## GROUNDWATER DATA MANAGEMENT

The Wisconsin Department of Natural Resources (DNR) has the responsibility of groundwater protection in the Division for Environmental Quality. The collection and coordination of groundwater data exchange within the DNR and with outside agencies has been increasingly important as an issue externally as well as internally within DNR. The DNR is currently in the middle of a renewed effort to coordinate the collection and retrieval of all groundwater data, as a result of DNR funding, inter-agency responsibilities, and cooperative agreements.

The DNR currently has a computer system called the Groundwater Information Network (GIN). The system's intent is to bring all DNR collected groundwater well inventory information and sample collection and results data under one common system format. Groundwater data from a variety of sources, including non-point source basin studies, county sampling projects, DNR management practice monitoring projects, DNR regulatory monitoring, and DATCP pesticide projects are some of the current data sources being brought together.

This GIN computer system is in the process of being migrated from the state regional computing facilities to the Department VAX network. The new system, the Groundwater Retrieval Network (GRN), will focus on data integrity and ease of use for the end users.

In order to provide access to the system for other state agencies, computer hardware and software has been provided to the Departments of Agriculture, Trade and Consumer Protection, Industry, Labor and Human Relations, and Health and Social Services; the Wisconsin Geological and Natural History Survey and the Central Wisconsin Groundwater Center. The sharing and exchange of information between agencies dealing with groundwater should be greatly enhanced by the completion of the GRN system.



## COORDINATION ACTIVITIES

### GROUNDWATER COORDINATING COUNCIL

The Groundwater Law, 1983 Wisconsin Act 410, established the Wisconsin Groundwater Coordinating Council to advise and assist state agencies in coordinating nonregulatory programs and exchanging groundwater information. The Groundwater Coordinating Council (GCC) consists of the heads of all state agencies with some responsibility for groundwater management plus a Governor's representative. The state agencies include the Departments of Natural Resources; Industry, Labor and Human Relations; Health and Social Services; Agriculture, Trade and Consumer Protection; Transportation; State Geologist (Geological and Natural History Survey) and the University of Wisconsin System (UWS). The GCC had four meetings during the past year and met once via teleconference. The meeting minutes are included in the appendix.

Much of the focus of the GCC's activities during the past year has been in response to the conference held in Stevens Point in March of 1991 titled, "Working Together to Manage Wisconsin's Groundwater - Next Steps". The conference was organized by Professors Steve Born and Doug Yanggen of the UW Extension to assess the groundwater management experience in Wisconsin and make recommendations for improving management of this valuable resource. The conference, which was endorsed by the GCC, brought together over 100 representatives of state and local governments and other interests. A large number of recommendations were made in several workshops which were held as part of the conference.

As a follow up to the conference, Prof. Born worked with representatives of the GCC agencies in preparing a set of action recommendations based on the results of the conference. These nine recommendations were endorsed by the GCC at its February 14 meeting (see Table 3).

Work has been initiated on all nine action recommendations. Discussions have begun to address the establishment of a data clearinghouse (action recommendation 1), compatibility of geolocated databases (recommendation 2), confidentiality of data recommendation 3), preparation of summaries of this Report to the Legislature for wider distribution (recommendation 7) and coordination of Clean Sweep efforts (recommendation 8). Figure 2 shows the locations of groundwater monitoring and research projects (recommendation 4). Representatives of organizations representing local government interests have been invited to the August 14 GCC meeting to discuss formation of a local government subcommittee (recommendation 5). A letter has been sent (dated July 8, 1992) to Department of Administration Secretary Klauser requesting funding for a pilot program for wellhead protection programs at the local level (recommendation 6). The GCC has endorsed a resolution supporting increased risk assessment outreach and educational programming by the University of Wisconsin Extension and has sent that resolution to the UW (recommendation 9); the resolution is contained in the appendix.

The GCC approved the 1993 fiscal year joint solicitation package for groundwater research and monitoring to meet state needs described in the previous section. The package is contained in the appendix. On April 10, the GCC met by teleconference and unanimously approved the proposed UWS groundwater monitoring program. The UWS will fund 8 continuing and 6 new projects in fiscal year 1993. This will be an annual process and will allow better coordination of groundwater monitoring and research in Wisconsin.

The GCC also approved minor amendments to the Memorandum of Understanding between the GCC, the UW System and the UW Groundwater Research Advisory Council (GRAC) which specifies the procedures for solicitation and selection of proposals for groundwater research within the UW System.

The GCC approved the purchase of computers for five state agencies to allow increased access to the Department of Natural Resources' groundwater information network. Computers were purchased for the Departments of Agriculture, Trade and Consumer Protection, Industry, Labor and Human Relations and Health and Social Services; the Wisconsin Geological and Natural History Survey and the Central Wisconsin Groundwater Center. This purchase will increase the coordination and sharing of groundwater data among state agencies.

In response to a request, the GCC agreed to include information on groundwater quantity in this Report to the Legislature. That discussion is contained under the Condition of the Resource discussion.

The GCC continued to maintain dialogue on groundwater issues with federal agencies. Representatives from the Soil Conservation Service (SCS), Agricultural Stabilization and Conservation Service (ASCS) and the U. S. Geological Survey (USGS) have attended Council meetings and are ex officio subcommittee members.

The subcommittee reports which follow summarize the actions taken by each subcommittee.

#### SUBCOMMITTEE ACTIVITIES

Research and Monitoring & Data Management Subcommittees - The two subcommittees reviewed the priorities for the DNR's groundwater management practice monitoring program for fiscal year 1993. The revised priorities were then included in the joint solicitation distributed by the UWS, DNR and DATCP in November, 1991.

The two subcommittees met again in February to review the proposals which had been received as part of the joint solicitation. Subcommittee members made recommendations which were used by the three agencies in deciding which groundwater-related proposals to fund for fiscal year 1993.

The Research Subcommittee met separately to consider publication of a summary of groundwater monitoring and research projects funded through the joint solicitation process. Since most projects are two-year studies which run from the beginning to the end of a fiscal biennium, the Subcommittee agreed that a summary of projects funded during each biennium should be published at the end of the two-year period. Status reports would be prepared for those projects not completed at the end of the biennium.

The Monitoring and Data Management Subcommittee worked out arrangements for the purchase of computer equipment described above. It is anticipated that this purchase will improve the sharing and exchange of information between agencies dealing with groundwater. The Subcommittee also began working on the establishment of a groundwater information clearinghouse and development of a policy on geolocated data.

Planning and Mapping Subcommittee - Much of the focus of the Planning and Mapping

Subcommittee has been on vulnerability or susceptibility mapping. The Wisconsin Geological and Natural History Survey is nearing completion of a report on what other states have done regarding susceptibility mapping. The Subcommittee identified a need for field verification of vulnerability mapping as a priority topic for the joint solicitation. The Subcommittee hopes that the results of a vulnerability study in Dane County which is nearly completed can be used to provide one or more training sessions to provide training in how to use susceptibility maps. The training would be aimed at state, local and federal staff who use susceptibility maps.

The Subcommittee also prepared a discussion on groundwater quantity issues which is contained in this report.

Education Subcommittee - The Education Subcommittee held a special meeting for interagency discussions of recommendations for private well testing frequency and parameters. The Subcommittee also reviewed educational materials produced by the DNR and the Radiation Protection Council on radon levels in private well water. The Subcommittee began working on three of the action recommendations endorsed by the GCC - establishment of a data clearinghouse, preparation of a map of joint solicitation projects and popularized summaries of this Report to the Legislature.

Table 3 - Action Recommendations for the  
Groundwater Coordinating Council for 1992

The following recommendations for action by the Wisconsin Groundwater Coordinating Council (GCC) are based on: a) the outcomes of a major GCC endorsed conference/workshop in March 1991; b) intra-agency review of actionable recommendations stemming from this event, as well as an assessment of internally recognized needs; and c) an inter-agency "brain-storming" session to look broadly at issues raised which are pertinent to the continuing success and improvement of the state's groundwater management programs. These recommendations were approved by the GCC at its February 14, 1992 meeting. The focus of these recommendations is non-regulatory and within the scope of the GCC mission.

1. The GCC will take the lead in the establishment of an information clearinghouse on groundwater databases. The clearinghouse would provide information for each database with regard to what's contained, where it's located, how it's accessed, etc., and would foster more uniform data collection. The clearinghouse should include both computerized and non-computerized databases. If additional funding is necessary to support such a clearinghouse, GCC will pursue funding through the legislative and agency budgetary processes. The GCC also supports promoting access to the groundwater data by other "customers" at the state and local level; a user needs survey may be a useful first step in ascertaining how/if to proceed further. The Monitoring and Data Management Subcommittee will work with the Education Subcommittee and develop a plan for establishing such a clearinghouse arrangement by August 14, 1992.
2. Groundwater management requires accurate spatially-referenced data. The GCC will work aggressively with state agencies and others to move towards compatible geolocated databases. The Monitoring and Data Management Subcommittee will prepare a briefing for the GCC by May 8 on the present status of standardized geolocation of data by state agencies, problems and obstacles to fully establish such a data-collection system, and recommendations on how to achieve this objective. The Subcommittee will work with the Wisconsin Land Information Board.
3. Landowners and other private entities appear to be very concerned about the confidentiality of groundwater data collected from their properties, particularly regarding fiscal and regulatory implications possibly associated with such information. The GCC supports review of the issue of how to gather and use groundwater data without jeopardizing the confidentiality of well owners. The Monitoring and Data Management Subcommittee will schedule a discussion/workshop this summer of agencies and other interested parties, including the Public Intervenor, to review this issue. An examination of how analogous databases (e. g. Storet, lead contamination, National Pesticide Study, etc.,) deal with this issue might be instructive. This activity should receive a high-priority because the confidentiality issue could be a serious impediment to groundwater protection in the long run.
4. To actively support groundwater education efforts throughout the state, the GCC supports preparation of a statewide map or maps showing the location of groundwater monitoring and research projects in the state. The Planning and Mapping Subcommittee will prepare at least one map that will be included in the 1992 Report to the Legislature and be distributed for educational purposes through the Education Subcommittee.

5. The GCC will create a Local Government Subcommittee to address issues of local concern and provide input to the GCC from a local perspective. The establishment of such a subcommittee acknowledges the key role of local governments in land use decisions, and therefore, groundwater management. GCC representatives will consult with associations representing local government and prepare a recommendation regarding formation of a GCC Local Government Subcommittee for consideration by the GCC at its next meeting. Early agenda items for the new subcommittee would include the development of pilot wellhead protection options (see 6) for consideration by the GCC and Legislature, state delegation of groundwater management-related authorities to local governments, and suggestions regarding improved state-local coordination on groundwater management issues.
6. The GCC supports the development of legislation to establish a financial incentive-based pilot program for wellhead protection area programs and other innovative groundwater management initiatives involving local governments. Funding options considered should include a small matching-grant program to stimulate local governmental activity in groundwater management. This issue will be referred to the Local Government Subcommittee once it is established.
7. The GCC recognizes the desirability and need for broader distribution of key findings from its Report to the Legislature. Interested audiences should have ready access to the annual assessment of groundwater conditions and problems and the status/effectiveness of management actions. To accomplish this, the Education Subcommittee will develop and distribute popularized brief summaries (perhaps in some kind of "report card" format) of the Report to the Legislature to a wider community of interests. The formats will be reviewed by the GCC at its August meeting. Regular timely distribution of such information could significantly enhance public awareness of groundwater issues. The distribution to a wider audience should be a marginal cost relative to the benefits of information dissemination.
8. The GCC supports and will facilitate the organization of a "Clean Sweep" workshop for state and local officials and groups that have been involved in Clean Sweep programs. A focused policy-oriented workshop would provide an opportunity to learn what works, identify problems, and work to improve effectiveness and better coordination of future efforts. As noted at the March 1991 Groundwater Management Conference, significant resources are going into a variety of Clean Sweep programs around the state. A careful examination and sharing of experience to date should provide guidance with regard to better achieving the pollution source management, educational, and stewardship objectives of these activities. Staff from the Departments of Natural Resources and Agriculture Trade and Consumer Protection will meet with other appropriate individuals to set up such a workshop. Funding will be sought to organize such an undertaking, with the expectation that programmatic and legislative recommendations will be the result.
9. The GCC supports UW Extension efforts to undertake risk assessment outreach and educational programming. The significant research capacity and knowledge base of university units concerned with groundwater management, public health, environmental toxicology and risk assessment need to be translated into public educational programs in this high-priority area. Critical and costly societal decisions will continue to be made to protect groundwater, and an informed public in this complex and controversial area is essential to good decision-making. The GCC encourages the University of Wisconsin to actively pursue staffing for this

critical educational need, recognizing the severe fiscal and staffing limitations that presently exist. A GCC resolution to the Board of Regents regarding this issue will be considered at the next GCC meeting.

These action recommendations were approved by the Wisconsin Groundwater Coordinating Council on February 14, 1992.

## **DIRECTIONS FOR FUTURE GROUNDWATER PROTECTION**

### **PRIORITY ISSUES THAT NEED TO BE ADDRESSED**

There are two priority issues that need to be addressed. One is the need for better communication between local and state government. This was well documented during the Conference on Working Together to Manage Wisconsin's Groundwater - Next Steps? which was held in March of 1991. The Coordinating Council is addressing this issue by scheduling a meeting with representatives of local government interests to discuss formation of a local government subcommittee to the GCC. This is an important step to address problems of mutual concern.

Another need is for a statewide data base and a central data catalog or clearinghouse. There need to be better efforts at collecting data and making it available in a uniform format. The DNR is currently in the middle of a renewed effort to coordinate the collection and retrieval of all groundwater data, through the redesign of the DNR's groundwater computer system and the purchase of computers for several state agencies. It is hoped that this effort will eventually allow more convenient electronic access to DNR data by state and local government agencies.

### **RESEARCH/MONITORING NEEDS**

The Groundwater Coordinating Council has identified two topics as high priorities for the joint solicitation for groundwater-related monitoring and research for fiscal year 1994. One is research on alternatives to on-site septic systems. As described under "Summary of Agency Responsibilities," there are currently no proven designs or installations of septic systems that consistently meet the nitrate standard. Although both the DNR and DILHR have funded monitoring projects in this area, additional work is needed to find solutions to this problem.

Another high priority topic is field verification of susceptibility or vulnerability mapping data. Based on information from the Planning and Mapping Subcommittee, little work has been done to date to verify whether susceptibility or vulnerability information is accurate. This topic should be prioritized for the joint solicitation for fiscal year 1994.

There has been considerable interest in providing an opportunity for researchers to share their findings periodically with interested individuals. The Coordinating Council recommends that a meeting or conference be held periodically to allow groundwater researchers funded by state agencies to discuss the results of their monitoring or research. This would promote better communication among the varied parties with an interest in groundwater protection.

### **AVAILABILITY OF APPENDIX MATERIALS**

The appendix contains the minutes of the Coordinating Council meetings during the 1992 fiscal year, tables summarizing VOC and pesticide occurrence data, a listing of groundwater-related publications in FY 92 and a copy of the joint solicitation for groundwater monitoring and research proposals for the 1993 fiscal year. To obtain a copy of the appendix, contact David Lindorff, Department of Natural Resources, Bureau of Water Resources Management, P. O. Box 7921, Madison, WI 53707 (608-266-9265).







