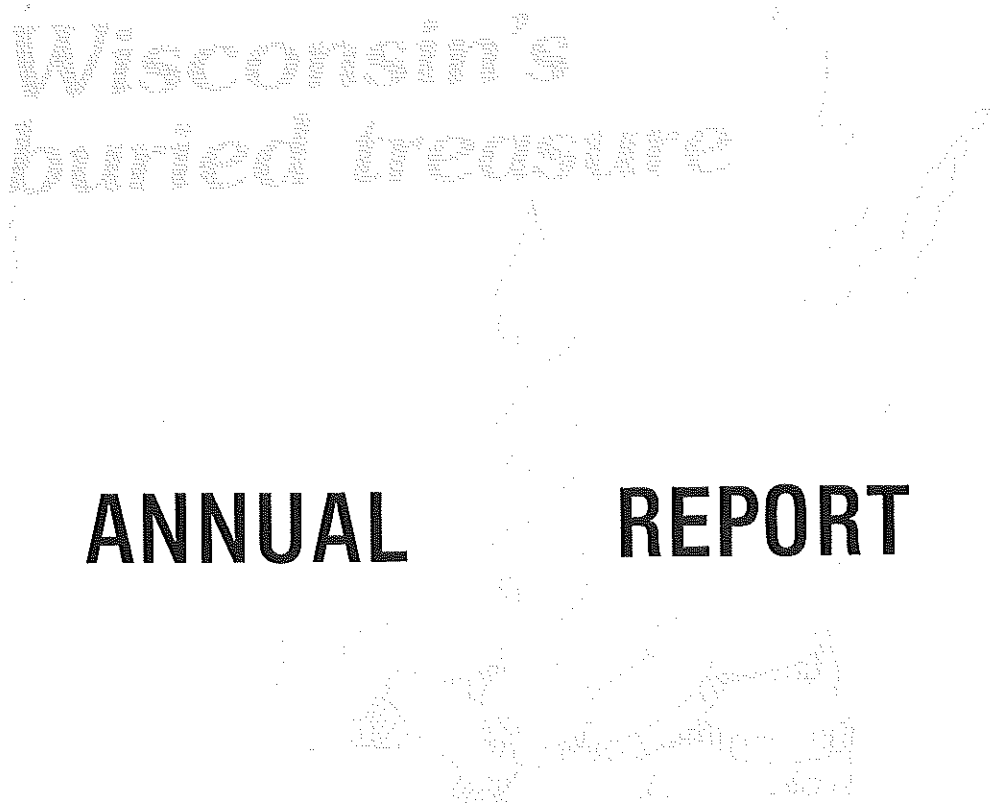
WISCONSIN GROUNDWATER COORDINATING COUNCIL



ANNUAL REPORT

TO THE LEGISLATURE

AUGUST 1985

GROUNDWATER COORDINATING COUNCIL MEMBERS

Department of Natural Resources - Lyman Wible (Chair)
Department of Health and Social Services - William Schmidt
Department of Agriculture, Trade and Consumer Protection - Orlo R. Ehart
Department of Transportation - Don Jorgensen
University of Wisconsin - Dallas Peterson
Department of Industry, Labor and Human Relations - Ed McClain
State Geologist (WGNHS) - Meredith Ostrom
Governor's Representative - Robert Fuller

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Department of Natural Resources - Michael Schmoller
University of Wisconsin - Dennis Keeney and Bill Fetter
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Approved by the Groundwater Coordinating Council

Lyman F. Wible 23 August 1985

BY: Lyman F. Wible, Chair

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES
Carroll D. Besadny
Secretary

BOX 7921
MADISON, WISCONSIN 53707

August 30, 1985

The Honorable Governor Anthony S. Earl
Senate Energy and Environmental Resources Committee
Assembly Environmental Resources Committee
Secretary Lowell B. Jackson - Department of Transportation
Secretary Howard S. Bellman - Department of Industry, Labor, and Human Relations
Secretary LaVerne G. Ausman - Department of Agriculture, Trade and Consumer Protection
Secretary Linda Reivitz - Department of Health and Social Services
Secretary Carroll D. Besadny - Department of Natural Resources
Acting President Katharine Lyall - University of Wisconsin
State Geologist Meredith E. Ostrom - Wisconsin Geologic and Natural History Survey

Enclosed is the first Groundwater Coordinating Council Annual Report to the Legislature. This report is intended to alert Wisconsin leaders to the state of our groundwater resource and to its management and protection. Sections 15.347(13) and 160.50, Wis. Stats., which established the Groundwater Coordinating Council, require that the Council submit a report in August of each year describing the Council's progress . The Council was formed to help state agencies coordinate their nonregulatory groundwater related activities, and serves as a groundwater information-exchange forum.

This Annual Report to the Legislature describes the state agency activities in implementing Chapter 160 Wis. Stats., established in the groundwater law. The report also describes what we know at this time about the condition of our groundwater resource including natural groundwater quality, as well as contamination by nitrates, volatile organic chemicals and pesticides. The report includes inventories by state agencies of their efforts in the areas the Council has focused on: research, monitoring, data management, planning, mapping, and education.

We hope that you, as heads of state agencies and leaders of this state, will direct your staffs to review this report and use it as a decision-making tool. Our groundwater is an invaluable resource and its proper management requires the coordinated efforts of our leaders. We are proud of this first report of the Council and consider it a positive step in enhancing interagency coordination. The cooperation of the various agency staff that participated in the development of the report is exemplary.

Additional copies of this report are available from the Department of Natural Resources, Bureau of Water Resources Management, Second Floor, GEF II (state mail) or P. O. Box 7921, Madison, WI 53707 (U.S. Mail). We hope you, your staff, and the public will find the report useful in protecting groundwater: Wisconsin's Buried Treasure.

Sincerely,
Groundwater Coordinating Council

Lyman F. Wible

Lyman F. Wible, Chair

WISCONSIN GROUNDWATER COORDINATING COUNCIL ANNUAL REPORT TO THE LEGISLATURE

AUGUST 1985

Prepared by Robin R. Schmidt

ACKNOWLEDGEMENTS

Staff of various agencies as represented on the Groundwater Coordinating Council and its subcommittees participated in drafting and editing portions of this report. The direction provided by Michael T. Llewelyn, Kevin K. Kessler, and Bruce J. Baker, Bureau of Water Resources Management; and the clerical support provided by Suzan B. Acre and her staff, Wisconsin Department of Natural Resources is also acknowledged.

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EXECUTIVE SUMMARY

Wisconsin Act 410, the groundwater law, established the Groundwater Coordinating Council, which helps state agencies coordinate their nonregulatory groundwater-related activities and serves as a groundwater information exchange forum. The Groundwater Coordinating Council's annual report alerts Wisconsin lawmakers to the state of our groundwater resource and to its management and protection. The first section is an introduction to the Coordinating Council's first annual report.

The next section, Implementation of Chapter 160, Wis. Stats., describes how the various agencies are implementing groundwater rules as identified in ch. 160, Wis. Stats. NR 140 identifies the standards set for constituents that have or could enter the groundwater as a result of a regulated activity as identified by the agencies. Many agencies have also developed rules that are now in legislative review for agency responses to standards violations.

The Assessment of the Groundwater Resource highlights what we know about groundwater quality. This report focuses on four major categories of constituents: natural groundwater quality, nitrates, volatile organic chemicals, and pesticides. Just as important, the report highlights the need to collect more and better groundwater quality information. In many cases, the more we look, the more problems we find. Groundwater monitoring is an essential part of protecting and managing our groundwater.

Following the assessment of the groundwater resource, the four main areas on which the Council is focusing its efforts are identified: research, monitoring and data management, planning and mapping, and education. The Council's first step in coordinating groundwater management activities is to define the current activities of the various state agencies in each of these four categories.

There is a large task before us if groundwater is to be adequately protected and managed. The present overall conclusion is that many agencies have a role in groundwater management and protection. Through this Council's work we can reduce gaps and overlaps that may exist in these agencies' roles. All state agencies must work together for the mutual goal of groundwater management and protection. The Groundwater Coordinating Council can provide a positive influence to all state agencies by supporting wise groundwater management decisions and identifying where we can make groundwater management improvements.

To date, the Council has made three recommendations for the Legislature to consider:

1. *The Groundwater Coordinating Council recommends that the Legislature address the problems with septage disposal (wastes pumped from septic and and holding tanks), by introducing and passing legislation similar to the septage and sludge management program that was proposed in the Assembly passed version of the 1985-1987 biennial budget bill, but subsequently removed by the Senate.*

2. *The Groundwater Coordinating Council is concerned that without rapid action by the Legislature, funding for the well compensation program created under s. 144.027, Stats., will end on June 30, 1986, prior to the following activities taking place: the appointment of a Legislative Council committee to study the well compensation issue; the Legislative Council committee making recommendations to the Legislature on the well compensation issue; and the Legislature acting on the recommendations of the Legislative Council committee. The Groundwater Coordinating Council recommends that the Legislature rectify this problem at the earliest possible date so that the citizens of Wisconsin will not be left without adequate compensation, but have recourse should their wells become unfit for use.*

3. *The Groundwater Coordinating Council recommends that the Legislature address the need for collection of statewide soils information through an accelerated soil survey by passing AB 202 (which was introduced in the 1985 Legislative Session and has not been reported out of Committee) or similar bill.*

The Groundwater Coordinating Council has identified and supports (through the deveopment of working subcommittees) the following nonregulatory activities as necessary components of a successful state groundwater management program: monitoring, planning, data management, mapping, research, and education. In addition, the Groundwater Coordinating Council has specifically highlighted and supports the following activities as they are often not given the full recognition and support that they deserve for their role in groundwater management and protection.

1. *The development and implementation of a state groundwater management plan with the cooperation of all state agencies. The Council also recognizes the importance of having a component of that plan be dedicated to the role of local government in groundwater management activities; and*

2. *Basic and applied research targeted to identified needs related to agency groundwater management decisions. The Council recognizes that research is critical for management of the groundwater resource to assure its wise use, protection, and continuing availability to this and future generations.*

INTRODUCTION

This is the first Annual Report to the Legislature by the Groundwater Coordinating Council as required by sec. 15.347, Wis. Stats., formed by 1983 Wisconsin Act 410, the groundwater law. The report describes the state of the groundwater resource and its management and summarizes Council activities to date.

In 1984, the Legislature enacted Wisconsin Act 410, historic groundwater legislation aimed at managing and protecting the state's groundwater. The Legislature specified in this law that the groundwater management activities of state agencies be coordinated through a newly formed Groundwater Coordinating Council.

The Groundwater Coordinating Council is directed by ch. 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 Groundwater Coordinating Council includes the Secretaries of the Departments of Natural Resources; Industry, Labor, and Human Relations; Agriculture, Trade and Consumer Protection; Health and Social Services; Transportation; the President of the University of Wisconsin System; the State Geologist (WGNHS); and a representative of the Governor. Acting members are listed on the cover page.

As of July 31, 1985, the Groundwater Coordinating Council has met four times, and has taken the following major actions:

(1) The Coordinating Council formed four subcommittees: Education, Research, Monitoring and Data Management, and Planning and Mapping. The structure and activities of these subcommittees are discussed in detail in section on Council Activities - Subcommittee Reports.

(2) The council adopted a resolution endorsing passage of AB 202, which creates an accelerated and coordinated soil survey program. Other topics presented to and discussed by the Council are described in the section on Council Activities - Major Council Actions.

(3) The Council made three recommendations and two "statements of support" to the Legislature. These are located in the Executive Summary and the Council Recommendations for Improving Groundwater Management and Protection Section of this report.

IMPLEMENTATION OF CHAPTER 160, WIS. STATS.

To date, the following actions have been taken by various regulatory agencies to implement ch. 160, Wis. Stats: (1) Each regulatory agency was required to submit to DNR a list of substances that have or could enter the groundwater as a result of an activity regulated by that agency. (2) The DNR then categorized the substances identified by the regulatory agencies as mandated in sec. 160.05 and determined whether the substances are of public health or public welfare concern. (3) In accordance with the procedures specified in ch. 160, DHSS recommended to DNR the enforcement standards and preventive action limit (PAL) for those substances that are a public health concern. (4) DNR established enforcement standards and PALs for substances of public welfare concern. Standards for a number of inorganic and organic substances were developed and incorporated into NR 140, which has just completed the legislative review process.

Each agency must develop rules that identify the range of responses it will take or require someone to take when preventive action limits or enforcement standards are met or exceeded. They must also determine in the rules the points of standards application. The following identifies actions the various agencies have taken to date to comply with ch. 160.

Department of Agriculture, Trade and Consumer Protection:

- Ag 161 - provides general regulatory requirements for the Department in it's implementation of ch. 160.21, Stats. This rule has completed the legislative review process and been submitted to the Revisor of Statutes.
- Ag 162 - relates to fertilizer bulk storage practices, as required in the groundwater law. This rule has completed the legislative review process and been submitted to the Revisor of Statutes.
- Ag 163 - relates to pesticide bulk storage practices, as required in the groundwater law. This rule has completed the legislative review process and been submitted to the Revisor of Statutes.

Department of Industry, Labor and Human Relations:

- ILHR 8 - relates to the regulation of underground petroleum product storage tanks, as required in the groundwater law. This rule is pending final drafting and public hearings.
- ILHR 83 - relates to private sewage systems. Code revision is in process for the entire chapter. Emergency rules on holding tanks were promulgated March 6, 1985, are finalized and in the Legislative review process.
- ILHR 43 - relates to the storage and handling of anhydrous ammonia fertilizer, as required in the groundwater law. This rules is in the legislative review process.

Note - DILHR has determined that their existing rules on agency response to standards violations are sufficient in the interim to comply with s. 160.21, Stats.

Department of Transportation:

Trans 277 - relates to the design criteria and remedial actions to be taken if standards are met or exceeded for the storage of highway salt. This rule has had one hearing to date and is still in draft form.

Department of Natural Resources:

NR 140 - establishes preventive action limits and enforcement standards for a number of inorganic and organic substances identified by the various state agencies; and defines the points of standards applications and the range of agency responses should a standard be exceeded. This rule has just completed the legislative review process.

A memorandum of understanding (MOU) has been signed by the Departments of Natural Resources and Industry, Labor, and Human Relations. Two MOU supplements have been signed, one of which provides for the joint review of large scale subsurface disposal systems (8,000 gallons per day).

Chapter 160, Wis. Stats., mandates that each regulatory agency promulgate rules to define design and management practice criteria to ensure facilities, activities and practices can meet the groundwater standards. This will be done after preventive action limits and enforcement standards become effective.

A Groundwater Fund was created under s. 25.48, Stats., to receive various fees established as part of 1983 Wisconsin Act 410. The fund is intended to provide monies for several state agencies to implement groundwater monitoring and groundwater standards-related programs established under Chapter 160, Stats. Table 1 identifies the amount and type of fees received in the Groundwater Fund in FY 85.

Table 1
REVENUE RECEIVED IN GROUNDWATER FUND

Revenue Type	1984-85 Revenue Amount
Fertilizer Sales Fee s. 94.64(4)(am)	$ 52,880.10
Pesticide Sales Fee s. 94.681(2)	300,556.00
Storage Tank Installation Fee s. 101.14(5)	30,000.00
Sanitary Permit Fee s. 145.19(6)	254,575.00
Waste Generator Fee s.144.441(7)	630,627.08
Septic System Servicing Fee s. 146.20(4s)(d)	18,650.00
Land Disposal Permitt Fee s. 147.02 and s. 147.033	86,200.00
Total Fees	$1,373,488.18
Investment Income	17,595.01
Total Groundwater Fund Revenue	$1,391,083.19
Transfer to Environmental Repair Fund	(-) 554,600.00
Net Groundwater Fund Revenue	$ 836,493.19

CONDITION OF THE STATE'S GROUNDWATER RESOURCE

CURRENT PROBLEMS

Existing and potential groundwater contamination prompted the development of the groundwater legislation 1983, Wis. Act 410. Wisconsin relies heavily on its groundwater. Ninety-four percent of Wisconsin's cities and villages and sixty-seven percent of Wisconsin's residents use groundwater for their drinking water. Our agricultural and industrial activities depend on groundwater to operate and survive. Also, once groundwater is contaminated, it is virtually impossible to clean. The combination of these facts makes groundwater protection a prime concern of everyone in Wisconsin.

In order to protect Wisconsin's groundwater, we need to know when there are changes in the resource's quality. To determine this, existing groundwater quality must be known. We are learning more about the present condition and quality of groundwater and about the activities that can contaminate groundwater. However, we cannot say we accurately understand the condition and quality of Wisconsin's groundwater. This report describes the results of groundwater monitoring and sampling that have been conducted to date through various agency programs.

Our knowledge of the condition of the groundwater resource must continually increase. But the cost of monitoring and the knowledge of what to look for and where to look make this a difficult task. This report describes what we know, but more importantly, will help you see why we are often not able to answer all the groundwater-related questions that concern the people of this state. The following information summarizes what we know about groundwater quality for four major categories: natural groundwater quality, nitrates, volatile organic chemicals, and pesticides.

NATURAL GROUNDWATER QUALITY

The natural groundwater quality varies greatly in Wisconsin and depends upon the rocks and minerals with which the water is in contact. Often, the groundwater derived from deeper aquifers has more pronounced mineral concentrations, because the water has been in contact with minerals longer. The problem constituents most common in groundwater are hardness, iron, manganese, sulfate, and radium. The problem with many natural constituents such as iron, sulfate, or manganese is not safety, but aesthetics. For example, high levels of iron can stain plumbing fixtures and laundry and give drinking water an unpleasant taste and odor. High levels of iron in drinking water have been found in hundreds of places statewide. Occasional high levels of flourides, manganese, sulfates, and lead are less common and more localized.

Naturally occurring radioactivity has become a new source of concern in Wisconsin, since some water systems have drinking water that exceeds the radium standard. The health concern associated with radium is the risk of bone cancer, because like calcium, ingested radium is incorporated into the bones.

Over the past several years, the state has initiated programs to test the groundwater for radioactivity. The drinking water in all the state's

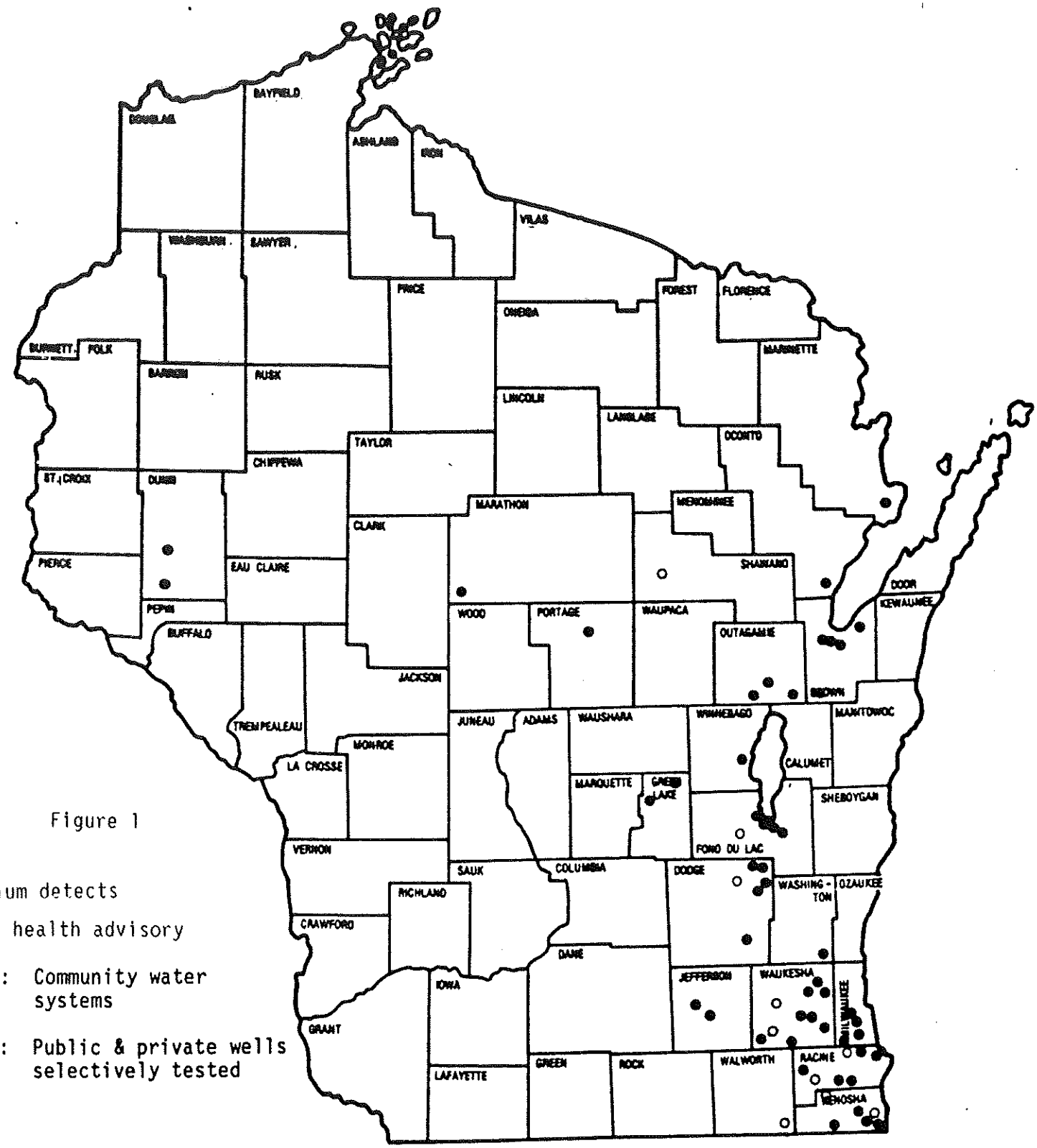

Figure 1

Radium detects over health advisory

- • : Community water systems
- o : Public & private wells selectively tested

community water systems and in selected public and private wells in 20 counties have been sampled. A DNR Bureau of Water Supply Report entitled "Radium in Wisconsin Groundwater and Removal Methods for Community Water Systems" explains these sample results. Much of this section is derived from that report and from a draft DNR report "The Safety of Wisconsin's Drinking Water."

The locations of wells with water exceeding the radium standard of five picocuries/liter (pCi/L) are shown in Figure 1. Most wells exceeding the standard draw water from deep sandstone formations and are located in an arc that extends from Green Bay to Kenosha. These are typically high capacity wells serving communities. Most of the counties outside this area will likely not have a radioactivity problem.

NITRATES

The contaminant most often tested for and often found to exceed the enforcement standard of 10 milligrams/liter (mg/l) is nitrate (NO_3-N). Nitrate is not usually harmful to adults or older children. In fact, we consume a great deal every day. But, stomach acid is not yet strong enough in some infants to prevent the growth of certain bacteria which can convert nitrate to harmful nitrite. Nitrites change the blood hemoglobin so that it cannot transport oxygen. The result is methemoglobinemia, called the "blue baby syndrome," which can be fatal. However, if the condition is diagnosed, removing nitrate from the infant's diet will cause the symptoms to rapidly disappear. Methemoglobinemia is difficult to diagnose and, until recently, was not a reportable disease. Therefore, the number of cases of this disease is unknown.

A 1979-1980 DNR study of 11,396 small public water wells (wells serving schools, churches, motels, service stations, campgrounds, and the like) found that 311 - about 1 in 40 (2.7%) - exceed the standard of ten mg/l of nitrate - nitrogen. More than one in three (33%) had detectable levels. Many of the wells with high nitrate levels were in the area of the state with highly permeable soils known as the central sands region. In a survey of 1,020 private wells in 1982 and 1983 in 14 counties of west central Wisconsin, 161 (15.8%) wells exceeded the enforcement standard for nitrate.

The Wisconsin State Lab of Hygiene (SLOH) conveniently and inexpensively tests water for nitrate, bacteria and flouride. Wisconsin well owners can take advantage of this service and have their water tested routinely. Table 2 shows the results of SLOH nitrate tests analyzed between June 1984 and July 1985. Of 1,235 tests conducted, 322 (26%) had nitrate concentrations above 10 mg/l.

Table 2
Private Water Supply Nitrate
Sample Results*
June 1984 - July 1985

County	Number of Samples	Number of Samples 10 mg/l	Percent of Samples 10 mg/l	Sample Results (mg/l) Average	Highest
Adams	13	5	38.5	12.9	92.0
Barron	59	24	40.1	9.1	25.0
Brown	36	1	2.8	0.86	10.8
Buffalo	3	2	66.7	8.6	14.8
Burnett	3	0	0.0	0.5	0.5
Calumet	11	2	18.2	4.0	13.4
Chippewa	23	10	43.5	10.0	37.0
Clark	7	0	0.0	5.5	9.6
Columbia	33	7	21.2	7.1	31.0
Crawford	4	1	25.0	5.0	18.1
Dane	188	61	32.4	7.8	31.0
Dodge	24	4	16.7	4.6	38.0
Door	11	0	0.0	2.6	8.6
Dunn	48	23	47.9	11.0	39.0
Eau Claire	8	1	12.5	2.6	11.0
Fond du Lac	18	5	27.8	5.9	16.1
Grant	21	7	33.3	6.5	19.1
Green	16	3	18.8	6.7	23.0
Green Lake	13	2	15.4	5.1	14.4
Iowa	24	10	41.7	12.7	61.0
Jackson	6	0	0.0	2.7	6.5
Jefferson	80	6	7.5	3.4	21.0
Juneau	5	1	20.0	4.6	19.9
Kenosha	2	0	0.0	0.5	0.5
Kewaunee	12	4	33.3	7.6	23.0
La Crosse	1	1	100.0	16.0	16.0
Lafayette	12	2	16.7	4.3	14.4
Langlade	19	3	15.8	7.4	21.0
Manitowoc	2	1	50.0	8.7	14.9
Marathon	29	20	69.0	14.6	38.0
Marinette	5	0	0.0	0.9	2.4
Marquette	13	0	0.0	4.2	9.0
Milwaukee	7	0	0.0	0.5	0.5
Monroe	11	3	27.3	6.5	15.5
Oconto	4	0	0.0	2.7	9.4
Oneida	2	0	0.0	0.5	0.5
Outagamie	3	0	0.0	0.5	0.5
Ozaukee	6	0	0.0	1.25	5.0
Pierce	27	3	11.1	5.8	53.0
Polk	5	0	0.0	0.5	0.6
Portage	60	35	58.3	12.8	42.0
Price	1	0	0.0	4.5	4.5
Racine	7	1	14.3	2.2	12.5
Richard	11	3	27.3	7.3	30.0
Rock	60	23	38.3	9.1	29.0
St. Croix	27	5	18.5	5.9	19.7
Sauk	34	9	26.5	6.8	25.0
Sawyer	1	0	0.0	7.5	7.5
Shawano	2	1	50.0	10.2	20.0
Sheboygan	7	0	0.0	0.5	0.5
Taylor	2	0	0.0	1.1	1.7
Trempealeau	6	1	16.7	4.7	12.5
Vernon	4	1	25.0	5.9	13.2
Vilas	6	0	0.0	2.6	8.4
Walworth	2	2	100.0	12.4	13.1
Washington	34	2	5.9	3.6	29.0
Waukesha	73	4	5.5	3.1	16.3
Waupaca	23	6	26.1	5.6	18.5
Waushara	24	7	29.2	7.6	38.0
Winnebago	7	0	0.0	0.8	2.7
Wood	32	10	31.2	7.1	27.0
TOTALS	1,235	322	26.07	6.8	92.0

*Source - Wisconsin Laboratory of Hygiene

Nitrate can enter the groundwater from many sources. Common sources include nitrogen based fertilizers, animal waste storage and feedlots, municipal and industrial wastewater, refuse disposal areas, and septic systems.

VOLATILE ORGANIC CHEMICALS

A volatile organic chemical (VOC) is a chemical that vaporizes under normal temperatures and pressures. Examples of VOC's include gasoline and industrial solvents or household products such as spot and stain removers, paints and thinners, drain cleaners, and air fresheners. Many VOC's are suspected carcinogens for long term exposure. In the short term, high concentrations of VOCs can cause nausea, dizziness, tremors, or other health problems.

Though many of these chemicals have been used for decades, it wasn't until very recently that the technology existed to accurately analyze and detect VOC's in water supplies. In 1980, the U.S. EPA funded the sampling of 500 municipal water supplies across the country for VOC's. In Wisconsin, ten municipal wells were selected randomly and ten municipal wells were selected based upon their susceptibility to contamination. This susceptibility was based on features such as wells drilled in a shallow aquifer, having a porous soil overlying the aquifer, and proximity to a contaminant source. Five of these 20 municipal systems contained detectable levels of VOC's. Because of these findings, Wisconsin expanded its VOC sampling program in 1982.

In July 1983, the DNR instituted a new sampling program to sample all community water supplies and 600 susceptible private wells per year for VOCs. The results of these sampling efforts show us that VOCs are a significant contamination problem in Wisconsin. To date, 3,150 wells have been sampled for VOC's. VOC's were detected in 8% of the public wells and in 16% of the susceptible private wells tested.

Table 3 lists the 26 different VOC's found in Wisconsin's groundwater to date. The most common VOC detected is trichloroethylene. The VOC most often detected at levels exceeding the enforcement standard is trichloroethylene. Benzene, a component of gasoline, has been found in 73 wells with the highest concentration being 14,000 parts per billion (the enforcement standard for benzene is 0.67 parts per billion). Benzene has been found at the most toxic concentration of the VOCs detected in Wisconsin's groundwater. Also shown on Table 3 are the newly established groundwater quality standards (both preventive action limits and enforcement standards) for 15 of the 26 VOC's, the number of wells that have had VOC's detected in them, and the number of detections that have exceeded the groundwater quality standards.

The major VOC sources, where sources could be identified or tentatively pinpointed, were leaking underground gasoline storage tanks, landfills and hazardous waste storage and handling facilities. Volatile organic chemicals disperse very quickly in the groundwater. Volatile organic chemicals often spread over a large distance (2 to 3 miles) in relatively uniform concentrations. Therefore, when various VOC sources are present in an area it may be very difficult to identify the specific source of contamination.

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Table 3

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SUMMARY OF GROUNDWATER VOC MONITORING
FOR 07/01/83 THRU 99/99/99

CHEMICAL CODE	CHEMICAL NAME	TOTAL NO. OF WELLS	WELLS WITH DETECTS	ENFORCEMENT STANDARD UG/L	WELLS EXCEEDING ENF. STD.	PREVENTIVE ACTION LIMIT	WELLS EXCEEDING PAL	HIGHEST DETECTION LEVE
20425	TRICHLOROETHYLENE	2910	149	1.8000	128	0.1800	149	270
20399	TETRACHLOROETHYLENE	2891	108	1.0000	102	0.1000	108	7500
20025	BENZENE	2863	73	0.6700	73	0.0670	73	14000
20167	1,2-DICHLOROETHANE	2851	47	0.5000	47	0.0500	47	400
20236	ETHYLENE DIBROMIDE	138	26	0.0100	26	0.0010	26	130
20169	1,1-DICHLOROETHYLENE	2848	23	0.2400	23	0.0240	23	26
20437	XYLENE (TOTAL)	2849	65	620.0000	9	124.0000	16	7400
20411	TOLUENE	2864	69	343.0000	8	68.6000	14	12000
20153	1,2-DICHLOROBENZENE	2839	4	10.0000	2	2.0000	2	43
20421	1,1,1-TRICHLOROETHANE	2888	121	200.0000	1	40.0000	10	300
20165	1,1-DICHLOROETHANE	2855	73	NONE	0	NONE	0	120
20171	1,2-DICHLOROETHYLENE	2875	60	NONE	0	NONE	0	87
20095	CHLOROFORM	2864	50	NONE	0	NONE	0	58
20233	ETHYL BENZENE	2851	50	NONE	0	NONE	0	1400
20427	TRICHLOROFLUOROMETHANE	2848	41	NONE	0	NONE	0	590
20051	BROMODICHLOROMETHANE	2851	22	NONE	0	NONE	0	11
20087	CHLOROETHANE	2839	19	NONE	0	NONE	0	46
20147	DIBROMOCHLOROMETHANE	2851	8	NONE	0	NONE	0	7.6
20157	1,4-DICHLOROBENZENE	2838	4	750.0000	0	150.0000	0	5.8
20073	CARBON TETRACHLORIDE	2838	2	NONE	0	NONE	0	4.5
20155	1,3-DICHLOROBENZENE	2838	2	NONE	0	NONE	0	23
20393	STYRENE	2838	2	NONE	0	NONE	0	2
20053	BROMOFORM	2849	1	NONE	0	NONE	0	6.6
20071	CARBON DISULFIDE	2838	1	NONE	0	NONE	0	0
20401	TETRAHYDROFURAN	2838	1	NONE	0	NONE	0	8000
20428	TRICHLOROTRIFLUOROETHANE	2839	1	NONE	0	NONE	0	1.9

identified problems as identified in Table 5 are divided into three categories: identified contamination sources (actual and potential), major institutional issues relating to groundwater management, and groundwater management operational issues.

Table 5
DNR Staff Perspectives of Groundwater Management Issues

I. IDENTIFIED CONTAMINATION SOURCES (ACTUAL AND POTENTIAL)

Leaking Underground Storage Tanks

* includes tanks, valves, and lines
* gas stations
* volatile organic chemicals (VOCs) such as benzene

Land Disposal of Wastewater

* concern with viruses and VOCs
* both existing and abandoned seepage cells
* smaller facilities which are not monitored

Manure Pits

* especially in areas of high bedrock

Pesticide Application and Disposal

* poor storage practices
* rinsing of containers and tanks
* replacement pesticides for aldicarb may also cause contamination
* veterinarians
* greenhouse operations
* ginseng cultivation

Active Landfills

* older, nonengineered sites that have been grandfathered under existing regulations
* unlicensed sites

Abandoned Landfills

* industrial sites
* pesticide dumping sites

Bulk Storage Areas

* coal
* salt
* fly ash

Sludge Spreading

* major concern for toxics
* municipal, industrial, paper mills

Land Spreading of Whey

Industrial Handling and Disposal of Hazardous Wastes

* solvent recycling operations
* dumping and spilling by small generators
* chemical companies

(continued)

Direct Conduits from the Surface to the Groundwater

* Improperly abandoned wells
* abandoned mineshafts
* non-potable wells - presently no design standards for these
* contaminated surface water drawn into municipal wells
* bacterial contamination due to poor well construction

Waste Disposal and Pesticide Use in Karst (limestone) Areas (southwest Wisconsin and Door County)

* animal waste
* septage disposal
* garbage in sinkholes
* pesticides

Agricultural Processing Activities

* canning
* silage
* land spreading of blood

Miscellaneous Commercial and Industrial Activities

* electroplaters
* dry cleaners
* quarries
* waste oil disposal
* junkyards - oil, gas, other fluids
* railroad tie disposal - preservatives
* paper mills - sulfite liquor, wood piles, sludge

Septage Disposal

Storage and Handling of Toxic and Hazardous Materials Other Than Wastes

* DATCP regulates fertilizers and pesticides, DNR regulates spills, and DILHR regulates petroleum products, however other materials are not covered

Nonpoint Source Best Management Practices

* potentially increase infiltration of nitrates and pesticides

2. MAJOR INSTITUTIONAL ISSUES RELATING TO GROUNDWATER MANAGEMENT

Better Coordination Between Agencies

* data sharing, interchange of expertise
* DHSS - District DNR Offices: notices not to drink the water
* DILHR-DNR: leaking underground storage tanks
* DATCP-DNR: silage
* DNR-local fire departments: leaking underground storage tanks and spill response
* UW-Extension-DNR: regional groundwater meetings

Regulations to Protect Groundwater

* better enforcement needed by DNR and other state agencies
* need for additional regulations
  - well abandonment
  - non-potable wells
  - monitoring around sludge spreading sites
  - storage and handling of virgin materials
* need for new regulation vs. the availability of staff to implement them
* need to better address environmental tradeoffs, for example the issue of building small wastewater treatment plants with surface water discharge vs. on-site systems

(continued)

Better Coordination Between DNR Programs

* Solid Waste - Water Supply: wells within 1200 feet of landfills
* Pretreatment Program - other DNR groundwater programs
* Priority Watershed Program - other groundwater programs
* Interchange of information and expertise

Data Management

* need the ability to determine aquifer susceptibility
* a tracking system for monitoring wells is needed
* amount of time involved in data entry into the data management system is a concern

How Clean is Clean?

* need to clearly define DNR's goals relating to groundwater contamination
* how far should we force cleanup?
* what should we do when background levels are above drinking water standards?
* the DNR has presented a moving target for "how clean is clean" and even the NR 140 standards can change yearly.

Information and Education

* need coordinated approach
* what audiences should be targeted?
* need more expertise relating to groundwater I&E

Groundwater Standards

* risk assessment needs to be better explained
* concern over the ability of existing solid waste and wastewater systems to achieve the new standards
* need predictive modeling capability to enforce standards and justify our actions
* lack of standards for toxic substances

3. GROUNDWATER MANAGEMENT OPERATIONAL ISSUES

Spill Cleanup

* who should pay and how much?
* what should we do in the case of bankruptcy?
* how long should we monitor after a spill incident?
* need more background information and follow-up
* need uniform cleanup procedures and standards
* when should the state pay for cleanup?

Groundwater Monitoring Program

* need consistent sampling techniques between programs and between districts
* need to know and sample for metabolites of new and familiar compounds
* need larger VOC sampling allotment
* lab capabilities not keeping up with needs
* need to monitor for non-volatile organic compounds

Sources of Groundwater Contamination

* need to know which parameters to sample for, for each type of potential contamination source
* need better background information at contamination sites
* need to do monitoring to verify locational requirements in administrative codes for various activities near wells
* need to do monitoring around types of potential contamination sites which have not yet been studied
* do not know the impact of smaller wastewater facilities where there are no monitoring requirements
* difficult to establish the relationship between agricultural land use and well contamination
* need to determine which abandoned landfills to investigate first

(continued)

Table 5 (concluded)

Monitoring Wells

* need consistent construction and sampling guidelines
* proper siting
* multiport sampling capability is needed
* need a tracking system for monitoring wells
* what types of monitoring equipment should each district have?

Groundwater Quantity Issues

* high capacity wells influencing private wells
* areas with no usable aquifer
* need to identify acceptable aquifers and how much water is available from them

Workload

* lack of staff to address groundwater problems that are discovered
* no time to analyze regulatory monitoring data
* too busy to evaluate the impacts of abandoned landfills

COUNCIL ACTIVITIES

SUBCOMMITTEE REPORTS

RESEARCH SUBCOMMITTEE

Goal - Prepare a research plan that identifies the most important groundwater research needs in the state, estimates the fiscal requirements to meet those needs, and assists decisionmaking in the budget process.

As a first step in meeting this goal, the research subcommittee developed a list of the nonregulatory groundwater research activities of UW, DATCP, DHSS, DILHR, WGNHS and DNR. There is a need for considerable research to determine how contaminants move from the land surface to groundwater. In order to protect the state's groundwater resources, well-focused applied and basic research is needed to determine the environmental fate and toxicological properties of chemicals, and the synergistic effects of multiple substances. Research is also needed on the distribution and hydrogeologic properties of geologic materials and groundwater throughout the state. The following is a list of state agency research activities.

UW

The University of Wisconsin identified seven general research goals on which its research projects are focused. These are the goals:

1. Determine transformation and transport mechanisms and rates for contaminants in the root, the vadose, and the saturated zones.

2. Determine factors controlling the movement and survival of pathogenic microorganisms, and of viruses in the vadose and saturated zones.

3. Evaluate microorganism survival and activity in the saturated zone.

4. Evaluate existing, and develop new best management practices for controlling groundwater contamination from industrial and agricultural activities.

5. Delineate and model contaminant plumes in the groundwater with the ultimate aim of predicting contaminant concentration over time and space.

6. Perform risk assessment analysis and develop pollutant criteria or standards.

7. Develop technology transfer programs.

Sixty-seven research projects, listed in Table 6, were identified by the UW as groundwater-related research they are conducting.

Table 6
Groundwater-related Research at UW - July 1985

	Title (descriptive)	Principal Investigator; Dept.	Cooperation	Funding Sources (if known)
1.	Recharge processes in Central Sand Plains	Bradbury, Ken; GNHS Anderson, Mary; Geology/Geophysics	GNHS	GNHS
2.	Hydrogeochemistry of groundwater in the Shullsburg area	Bradbury, Ken; GNHS Anderson, Mary; Bowser, C; Geology/Geophysics	GNHS	WRC
3.	Marathon County water resources	Bradbury, Ken; GNHS Anderson, Mary; Geology/Geophysics	GNHS	GNHS
4.	Geophysical investigation of the hydraulic connection between Lake Michigan and West Shoreline aquifers	Anderson, Mary; Geology/Geophysics	D. Cherkauer/ R. Taylor UW-Milw.	Sea Grant
5.	Groundwater interaction with partially penetrating streams	Anderson, Mary; Geology/Geophysics	GNHS	None
6.	Modeling of the Fox River Basin-Brown Co.	Anderson, Mary; Geology/Geophysics	None	WRC
7.	Comparative studies of a suite of lakes in Wisconsin	Anderson, Mary; Geology/Geophysics	J. Magnuson et al., Ctr. Limnol.	NSF-LTER
8.	Geochemical study of groundwater-lake interaction around Sparkling Lake	Anderson, Mary; Bowser, C.; Geology/Geophysics	Ctr. Limnol.	NSF
9.	Chemical evolution of groundwater in Crystal Lake	Anderson, Mary Bowser, C. Geology/Geophysics	Ctr. Limnol.	NSF
10.	Lag times for lake acidification	Anderson, Mary Bowser, C. Geology/Geophysics	Ctr. Limnol.	NSF
11.	Groundwater component of the water budget for Crystal Lake	Anderson, Mary Bowser, C. Geology/Geophysics	Ctr. Limnol.	NSF
12.	Effects of aquifer heterogeneity on contaminant movement in groundwater	Anderson, Mary Geology/Geophysics	None	NSF
13.	Groundwater movement around Crystal Lake bogs	Bowser, C. Geology/Geophysics		
14.	Fractured rocks and groundwater flow	Mikelson, D.; Geography Bradbury, K.; GNHS		
15.	Behavior of dense plumes of wastewater in groundwater	Hoopes, J.; CEE		
16.	Behavior of immiscible spills in water table aquifers	Hoopes, J.; CEE		

(continued)

Table 6 (continued)

	Title (descriptive)	Principal Investigator; Dept.	Cooperation	Funding Sources (if known)
17.	Modeling and field measurements of pesticide movement and sorption in the unsaturated and and saturated zones	Hoopes, J.; CEE		
18.	Modeling and statistical analysis for assessing compliance with groundwater standards	Hoopes, J.; Potter, K.; CEE		
19.	Field observations of mounding and of hydraulic conductivity and evaluation of models of mounding under land disposal sites for municipal wastewater	Hoopes, J.; Monkmeyer, P.; CEE		
20.	Field denitrification of occurrence of VOC's in groundwater from small community septic tank-soil absorption systems (Submitted)	Boyle, W.; CEE	Soil Sci., Agric. Engr.	SSWWP
21.	Evaluation of groundwater gradient control designs for sanitary landfills and assessment of their performance (Submitted)	Hoopes, J.; CEE		
22.	Vertical mixing in chemicals in groundwater associated with double diffusion (Submitted)	Green, T.; CEE		
23.	Design of infiltration field for stormwater management for Strickler Pond (Submitted)	Potter, K.; CEE		
24.	Effects of wastewater percolation fields on groundwater quality	Boyle, W.; CEE		SSWMP
25.	Ridge and furrow treatment of cheese factory wastes and groundwater quality	Boyle, W.; Berthouex, M. CEE		WDNR
26.	Presence of organic chemicals in leachate and groundwater around foundry waste landfills	Boyle, W.; Hams, R.; CEE		Am. Foundry Society
27.	Oxygen transfer in soil and wastewater treatment	Boyle, W.; CEE		SSWMP
28.	Overland flow treatment of municipal wastewaters	Polkowski, L.; CEE		Municipal
29.	Risk assessment of contaminated sludge to farmland	Berthouex, M.; CEE		Madison Sewer Dist.
30.	Land application of municipal sewage sludge	Peterson, A.; Keeney, D.; Soil Sci.		Municipal
31.	Application of paper mill sludge to forest lands	Bockheim, J.; Soil Sci.		Industry
32.	Methodology for estimating nitrate emissions from the root zone	Keeney, D.; Soil Sci.		Industry
33.	Evaluation of animal manure application rates to maximize efficiency and minimize nitrate pollution	Kelling, K.; Soil Sci. Converse, J.; Agric. Engr. Kenney, D.; Soil Sci.	Agric. Engr.	Industry

(continued)

Table 6 (continued)

	Title (descriptive)	Principal Investigator; Dept.	Cooperation	Funding Sources (if known)
34.	Management techniques to minimize nitrate leaching from irrigated sandy soils cropped to corn or potatoes	Keiling, K.; Keeney, D.; Soil Sci.		Industry
35.	Nitrogen credits from legumes	Bundy, L.; Soil Sci.		Industry
36.	Use of profile nitrate by corn	Bundy, L.; Soil Sci.		Hatch
37.	Leaching and dissipation of herbicides in loamy sands	Binning, L.; Horticulture		Hatch
38.	Field evaluation of pesticide movement	Wyman, J.; Entomol.	CEE, J. Hoopes	
39.	Economic and institutional aspects of the irreversibility of groundwater contamination	Segerson, K.; Agric. Econ.		Hatch
40.	Compensation of well owners	Yanggen, D.; Barrows, R.; Agric. Econ.		
41.	Epidemiology of nitrate in Portage County water supplies	Kanarek, M.; IES/Prev. Medicine	Environ. Tox. Ctr.	State
42.	Relationship between groundwater quality and colon cancer	Kanarek, M.; Prev. Medicine	State	EPA
43.	Modeling of subsurface transport of pollutants controlled by sorption reactions	Anderson, Marc Water Chem./CEE		DOE
44.	Physical aspects of transport of organic compounds in groundwater	Armstrong, D.; Andren, A.; Water Chem./CEE		
45.	Pesticides in groundwater	Chesters, G.; Harkin, J.; Soil Sci./Environ. Tox.		Hatch, USDI-OWRT
46.	Factors affecting the persistence of aldicarb residues in groundwater	Harkin, J.; Chesters, G.; Soil Sci./Environ. Tox.		Hatch, Industry
47.	Nitrate in Wisconsin wells and incidence of nitrate toxicity	Harkin, J.; Soil Sci./ Environ. Tox.		
48.	Leaching of pollutants from flyash storage ponds	Chesters, G.; Simsiman, G.; Soil Sci./Water Resour. Ctr.		
49.	Evaluation of groundwater quality data in Wisconsin	Chesters, G.; Soil Sci./Water Resour. Ctr.		

(continued)

Table 6 (concluded)

	Title (descriptive)	Principal Investigator; Dept.	Cooperation	Funding Sources (if known)
50.	Evaluation of flyash leachate as a potential groundwater contaminant	Lowery, B.; Soil Sci.		Grad. School EPRI
51.	Evaluation and development of porous media water samplers (Submitted)	Lowery, B.; McSweeney, K.; Madison, F.; Soil Sci.		Industry
52.	Effects of over-irrigation and hilling on aldicarb movement in soil	Curwen, D.; Hort./Hancock Exp. Stn.		
53.	Water and nitrogen use on irrigated potatoes	Curwen, D.; Wels, G.; Hancock Exp. Stn.		
54.	TCE in Delavan groundwater	Harkin, J.; Soil Sci./ Environ. Tox.		Grad. School
55.	Use of chemical and water level data to define recharge area of Stevens Point well field	Shaw, B.; UW-Stevens Point	GNHS	Municipal
56.	Fate of aldicarb in groundwater under a central Wisconsin farm	Shaw, B.; UW-Stevens Point		
57.	Pesticide and inorganic chemical movement to the Little Plover River	Shaw, B.; UW-Stevens Point		
58.	Movement of nitrate and chloride from barnyards and filter strips on sandy soils	Shaw, B.; Hensler, R.; UW-Stevens Point		DAR, DATCP
59.	Nitrate and VOC's in municipal drinking water	Tinker, J.; UW-Eau Claire		
60.	Relationship of karst landforms and groundwater quality in Door County	Stieglietz, R.; Wiersma, J.; UW-Green Bay		
61.	Nitrate distribution and mobility in the Prairie du Chien group	Huffman, S.; UW-River Falls		
62.	Groundwater interaction with Lake Michigan	Cherkauer, D.; UW-Milwaukee	M. Anderson, Uw-Madison	
63.	Groundwater resources of northern Ozaukee County	Cherkauer, D.; UW-Milwaukee		
64.	Role of groundwater in wetland hydrology	Cherkauer, D.; UW-Milwaukee		
65.	Mechanisms for measuring hydraulic conductivity of fine-grained materials	Cherkauer, D.; Palmer, C.; UW-Milwaukee		State
66.	Development of an improved bore-hole dilution device (Submitted)	Palmer, C.; UW-Milwaukee		
67.	Effect of bore-hole storage on estimation of transport parameters (Submitted)	Palmer, C.; UW-Milwaukee		

DATCP

The Department of Agriculture, Trade and Consumer Protection is developing several research projects. The goal of this research is to provide information necessary to accomplish departmental duties. Brief descriptions of present research activities are as follows:

1. Pesticide Use Survey: currently being designed to provide comprehensive data on pesticide use in Wisconsin. A cross-reference of pesticides to crops, target pests, application rates, application acreage, irrigation acreage, and soil texture will be the end product. The number of pesticides and level of detail will be a factor of obtaining statistically valid sample sizes. The survey covers the 1985 growing season and should be completed in late 1986.

2. Model County Animal Waste Management Plan: focusing on the groundwater issues from a barnyard management standpoint. This is a joint project between the DATCP, Portage County, and the University of Wisconsin-Stevens Point. The model plan will have two components. The first component consists of methodology being developed by the College of Natural Resources to prioritize areas within county boundaries which may be susceptible to adverse groundwater impacts due to sensitive soil or bedrock conditions. The second component consists of developing a methodology to determine if a specific barnyard has the potential to adversely impact groundwater. It is anticipated this evaluative tool will be useful not only to Portage County and the DATCP, but also to DNR for their animal waste and Nonpoint Source Program activities.

3. Relationship of Groundwater and Pesticide Persistence: focusing on aldicarb persistence in groundwater near Plover, Wisconsin. A joint project between the DATCP and the University of Wisconsin, the study is based on extensive monitoring of a small regional area to provide detailed information on groundwater flow, groundwater geochemistry, contamination extent, and concentration change rates. The data will provide insight into the relationship between groundwater geochemistry and pesticide persistence. The information will aid in the regulation of aldicarb and other pesticides exhibiting similar persistence/geochemistry relationships.

4. Potential of Pesticide Leaching from Normal Agricultural Use Practices: focusing on a worst case situation. Monitoring well nests will be installed down-gradient of fields receiving applications of pesticides with a high potential to leach into groundwater. The fields will be in areas designated as highly susceptible to groundwater contamination. The worst case information will be a first step in determining the need and extent of regulation required on agricultural use practices.

Proposed research plans within the DATCP include animal waste storage practices, filter strips for animal waste, specialty crop pesticide use, mixing/loading site management practices, pesticide use in karst and/or fractured bedrock regions, and disposal of pesticide waste. Topic

proposals and their subsequent ranking are the result of perceived public information and regulatory needs. Efficient and effective regulations will be the product of effective data gathering.

DHSS

The following is a list of groundwater-related research activities DHSS is involved with.

1. Evaluate DNR-designated compounds that have affected or could affect Wisconsin groundwater.

2. Analyze scientific information regarding the extent of contamination of each known toxic substance in Wisconsin groundwater.

3. Evaluate the compounds based on the type of health risk and the risk assessment of the compound using the valid scientific knowledge available.

4. Analyze all toxicological data available, including toxicity levels, long-term exposure risks, chronic and sub-chronic effects, oncogenic, mutagenic, or teratogenic activity, etc.

5. Develop the recommended enforcement standard for substances of public health concern to be used by the DNR. DHSS also prepares health advisories for areas with contaminated groundwater.

6. Prepare toxicological reviews of the literature on selected groundwater contaminants to support NR 140.

7. Prepare scientific documents to provide the public with information on groundwater contaminant health effects.

8. Conduct epidemiologic investigations of alleged health effects from the various toxic compounds detected in the groundwater, through DNR groundwater monitoring of public and private wells. In such instances, the health effects, enforcement standards for each substance, and their toxicological data are reported.

DILHR

DILHR is researching the use of new private sewage systems and expanding the site limitations delineated in the Wisconsin Administrative Code for existing types of designs. In conducting this research, DILHR cooperates closely with the Small Scale Waste Management Project at the University of Wisconsin - Madison, a group also affiliated with WGNHS. The state has funded research into two types of activities dealing with private sewage systems: a grant to study the use of at-grade soil absorption systems (essentially a mound system designed without sand beneath the distribution piping), and research into the use of large private sewage systems and their groundwater impacts. DILHR is also involved in approving experimental systems for which the university has sought plan approval. All experimental systems installed in this state must obtain

plan approval, and project managers work closely with the Small Scale Waste Management Project to determine what types of research objectives have not been met. The types of experimental systems which we have been experimenting with at the current time are listed below:

1. Mounds for permeable soil with less than 2 feet to high groundwater
2. Mounds on filled sites
3. Mounds for sites with percs slower than 120 min/inch
4. Mounds on excessive slopes
5. In-ground pressure distribution systems - restrictive soils
6. At-grade systems - gravity
7. At-grade systems - pressure distribution
8. Combined domestic waste/animal waste system
9. Interceptor drains, vertical drains, and surface discharge drains
10. Curtain drains and underdrains
11. Deep systems
12. Alternating beds (each bed 50% of required)
13. Graywater reuse systems
14. Large systems

WGNHS

Groundwater research at the Geological and Natural History Survey consists of basic data collection, survey analysis and the application of general principles toward problem-solving and decisionmaking.

Current groundwater-related research projects are as follows:

1. W85 001 Maquoketa Shale Study: The Maquoketa Shale is the major confining bed between the dolomite and sandstone aquifers of eastern Wisconsin. Any groundwater recharging the sandstone aquifer in eastern Wisconsin must pass through the shale. Knowledge of the geology and hydrologic properties of the shale is very poor and such knowledge is critical in evaluating problems such as radioactivity, saline groundwater, pumping effects, and contamination potential in the deep aquifer of eastern Wisconsin.

   This new project will review the existing data base on the hydrogeology of the Maquoketa Shale, do localized aquifer testing, and support research on the geology and hydrogeology of the shale.

The aquifer testing will be done in cooperation with, and cost-shared with, USGS and the City of Fond du Lac.

2. W86 001 Groundwater Flow Systems in Wisconsin: Recent concern about groundwater recharge, groundwater contamination potential, and long term waste isolation have prompted studies of groundwater movement through various geologic materials. Hydrogeologic data, including hydraulic head profiles, field determinations of hydraulic conductivity, major ion water chemistry, and radiocarbon and other environmental isotopes (^{18}O, ^{2}H, and ^{3}H) give information on the age and movement of groundwater.

   As part of this project, water samples will be collected from piezometers, wells, and springs. Areas of special importance are the clay tills of northern and eastern Wisconsin, fractured "granitic type" rock in central Wisconsin, and fractured dolomite in eastern and southwestern Wisconsin. The results and conclusions will be published and distributed by information bulletins and professional papers for maximum use by agencies, industry, and the public.

3. W85 014 Heat Pumps: The impacts of injecting groundwater heat pump discharge water directly into an aquifer are being studied in this continuing project. This is the only heat pump injection installation being monitored in Wisconsin for potential physical and chemical changes in the groundwater. Monitoring began in 1980 and will continue for at least two more years.

4. W85 015 Hydrogeological Properties of Glacial Materials: Glacial materials, consisting of till, outwash, and silt/clay deposits, form the uppermost geologic units over much of Wisconsin. Because these materials cover underlying bedrock aquifers, they control groundwater recharge and contaminant movement to the aquifer and often form an important shallow aquifer themselves. Data on the permeability and porosity of glacial materials are essential for the management of many groundwater related activities.

   Although numerous tests of the hydrogeologic properties of glacial materials in Wisconsin have been made by engineering firms, regulatory agencies, and research groups, this information has never been organized or summarized in a manner to make it generally accessible. In addition, because the glacial unit tested is rarely identified, the extrapolation of existing data to new sites has been difficult.

   This new project will identify the hydrogeologic properties of known, mapped glacial stratigraphic units in Wisconsin. The results will be maps or publications that describe the properties of these materials by hydrostratigraphic unit, giving both the expected value and approximate range of each property. Currently no such documents exist for Wisconsin. Such information will be of use to regulatory officials, engineering firms, and local and state government agencies dealing with shallow groundwater movement and contamination.

This three-year project will have two phases. Phase I (first year) will consist of collection, cataloging, and interpretation of existing hydrogeologic and geotechnical data from the files of the Wisconsin DNR, engineering consulting firms, Wisconsin Department of Transportation, GNHS, graduate theses, and other sources.

Phase II of the project (years 2 and 3) will consist of the actual collection of new field data from areas of the state or stratigraphic units identified in Phase I as having insufficient information. In addition, this phase will develop a methodology for the systematic determination of permeability of glacial deposits in the field and laboratory.

5. W85 016 Shullsburg Mine Water Contaminant Transport: After closure of zinc-lead mines near Shullsburg, Wisconsin in the mid-1970's, levels of dissolved sulfate in groundwater began to rise and have now exceeded safe drinking water limits. This contamination problem has caused the abandonment of over ten water supply wells in the Shullsburg area. During 1983 the Wisconsin Water Resources Center funded a two-year study to determine the geochemical processes leading to the contamination problem and the hydrogeologic processes affecting the spread of contaminants. This project involves the collection of new field data on water chemistry and hydraulic heads combined with computer modeling of geochemical processes and groundwater flow.

6. W85 017 Groundwater Recharge Processes in the Central Sand Plains: Understanding of groundwater recharge processes in the central sand plains is essential to the responsible application of pesticides and agricultural chemicals in the area. Recharge, the process by which infiltrating rain or irrigation waters enter a groundwater flow system, does not occur at equal rates at all points on the landscape. Actual measurements of recharge rates are now being made at three research sites in Portage and Wood Counties. Results of this project fill a major gap in our understanding of groundwater contamination problems and processes. This information is vital to the development of management plans for this high priority groundwater area.

   To date, the project has utilized both existing and new data to track the movement of water from its first contact with the land surface as rainfall or irrigation spray until it either enters the groundwater system or leaves the soil through evapotranspiration. A major accomplishment has been the development of an automated system to simultaneously measure precipitation, evaporation, groundwater levels, and soil moisture at individual research sites. Use of multiple sites shows how recharge varies across the landscape.

7. W85 018 Basin and Flow System Delineation in the Central Sand Plains: Responsible application and regulation of agricultural chemicals in the central sands area requires knowledge of the configurations and boundaries of groundwater flow systems. One groundwater basin and flow system has been delineated in the central

sands region. This basin is bounded in part by drainage ditches which also function as very efficient groundwater discharge boundaries. The depth of the groundwater flow that is intercepted by the drainage ditch is much greater than expected, so the small groundwater basin concept of agricultural chemical management may be a useful land-use guide. This project will identify and map additional groundwater basins and basin boundaries in the central sand plains. To date, hydrogeologic work in the study basin has involved mapping recharge and discharge areas and basin boundaries using many monitoring wells. Future work will concentrate on developing a methodology to delineate recharge and discharge areas using more limited field work.

8. W85 029 Groundwater in Low Permeability Materials: Initiated in 1981, this study responds to recent concerns about groundwater recharge, waste disposal siting, and contaminant migration. Hydrogeologic data, including hydraulic head profiles, field and laboratory determinations of permeability, major ion water chemistry, and environmental isotopes, have been combined with studies of till stratigraphy and till fracturing to give information on the age and vertical movement of groundwater through thick, clayey glacial till in northwestern Wisconsin. Results from this study will help determine appropriate locations for toxic and hazardous waste disposal sites.

9. W85 030 Reliability of Water Table Maps Based on Unverified Well Construction Reports: This project is designed to test the accuracy of unverified water table maps which have been prepared for the central sands region to show groundwater elevations and flow directions in permeable, unconfined glacial aquifers with shallow water tables. This project will compare maps from project W85 018 with the unverified maps and construct a third map which shows the disagreement between the two.

10. W86 008 Groundwater Recharge in Wisconsin: An understanding of the groundwater recharge processes in Wisconsin is essential for groundwater management. Recharge, the process by which infiltrating rain or irrigation waters enter a groundwater flow system, does not occur at equal rates at all points on the landscape. Actual measurements of recharge rates have been made in the central sand plains, and a workable field technique has been developed. Results of this project will provide a better understanding of groundwater contamination problems and processes in this area.

    The project, an outgrowth of project W85 017 above, will track the movement of water from its first contact with the land surface as rainfall or irrigation spray, until it either enters the groundwater system or leaves the soil through evapotranspiration. The goal of the project is to provide a measure of recharge rates and an understanding of recharge processes for all major aquifers and hydrogeologic units in Wisconsin.

11. W86 009 Correlation between Precipitation and Groundwater Levels: Wisconsin is periodically subjected to prolonged periods of deficient and excessive precipitation. Precipitation is the major source of groundwater recharge, and therefore variations of rainfall amounts have direct bearing on groundwater levels, storage, and contaminant transport. The need to better understand the relationship of precipitation and groundwater levels in humid areas became apparent during the 1976-77 drought which caused a serious water shortage and disruption of water supplies. In many cases, these problems could have been avoided if the long-term trends in groundwater levels and their recurrence intervals were known and people in the areas most likely to be affected were warned. On the other hand, the recent period of above-normal precipitation in Wisconsin has resulted in rising lake and groundwater levels, which create flooding of lakeshore properties and low-lying fields. Again, people and local officials were caught by surprise, because they do not understand the natural periodicity of rainfall amounts and groundwater levels.

    Currently, there are no techniques available for prognosis of excessively dry or excessively wet years. However, data exists that could be put to this use. For example, in Wisconsin the data on precipitation have been collected for more than 90 years and water levels in observation wells have been measured for more than 40 years. The length of observations is sufficient to subject them to statistical analysis of long-term trends and cycles.

DNR

The DNR does not directly conduct groundwater research but administers, supports, and cooperates with other agencies on groundwater-related research. The following list identifies the research areas the DNR feels are priorities. These priority research areas are not in any ranked order.

1. Research on the physical and chemical properties of glacial materials and bedrock units.

2. Research on best management practices to reduce groundwater impacts from agricultural activities, petroleum storage, industrial activities, etc.

3. Research on improved laboratory procedures to detect organic groundwater contaminants and their breakdown products in soil and groundwater.

4. Research on improved groundwater monitoring techniques including well construction, well installation, and sample collection.

5. Research on the health impacts of groundwater contaminants including any interactive or synergistic effect.

6. Research on the movement and environmental fate of contaminants in the saturated and unsaturated zones.

7. Research on the use of computer models to predict the groundwater impact from regulated facilities (flow and contaminant transport models).

8. Research on improved facility design to reduce the groundwater impacts from regulated activities (i.e., solid waste and wastewater disposal sites).

MONITORING AND DATA MANAGEMENT SUBCOMMITTEE

Goal 1 - Develop an integrated groundwater monitoring plan that most efficiently uses available resources to provide the information needed to manage and protect groundwater resources.

Goal 2 - Propose a plan for establishing a data management system that ensures state agencies can access accurate, up-to-date information on the state's geology and groundwater resources.

The Monitoring and Data Management Subcommittee met in June and July to discuss its role and to develop its portion of this report. The subcommittee prepared an inventory of monitoring activities being conducted by each of the state agencies as a first step to meet its goal. This inventory follows the subcommittee recommendations.

Data Management

The subcommittee is also acting as the steering committee for a consultant hired as a result of the groundwater law. Section 203818 of Wisconsin Act 410 (the groundwater law) directed that "the Department of Natural Resources shall utilize $55,000 for groundwater monitoring, evaluation and coordination activities." The Department has contracted with a consultant for this purpose.

The contract directs the consultant to do the following:

1. Inventory and summarize groundwater quality and contaminant source information data bases for each of the designated agencies. The information shall be categorized into one of three categories - contaminant source, groundwater quality, or geological information. Summary documents must indicate whether the data are presently computerized or in manual retrievable form.

   The summary of each agency's data shall include a description of the format in which the data is presently stored; whether there is a geolocator(s) attached to the data, and if so its type (i.e., latitude-longitude, quarter section, county...), a copy of the form the information is captured on, and if computerized, a summary of the computer system used, including standard outputs, must be provided.

2. Identify the groundwater data needs and priorities of each of the designated contact agencies.

3. Evaluate the adequacy of each agency's existing data bases to the agency's identified needs, the agency's priorities, and the agency's ability to fund additional data base capability.

4. Evaluate alternatives for data management improvement to meet the agency's identified priority needs. The alternatives evaluated should include, but not be limited to, water quality data storage and retrieval systems such as WATSTORE, GWIS, and STORET.

5. Evaluate the feasibility and associated costs of linking with existing data bases.

6. Prepare monthly progress reports and submit final reports acceptable to the Department of Natural Resources, summarizing the above information by December 31, 1985.

The subcommittee approves the scope of the project as written and has the following recommendations.

1. Where feasible, all state agencies should provide uniform location information for monitoring and contaminant source data so that agency systems can interface.

2. Within the next year implement sec. 160.21(2)(e), Wis. Stats., which requires the Department of Natural Resources and each regulatory agency to enter into a memorandum of understanding setting forth criteria for acceptable monitoring wells and sample handling for points of standards application.

3. Where feasible, all state agencies should develop and use standard guidelines for data collection.

Monitoring

The following is a list of the monitoring data collected to date by state agencies represented on the Groundwater Coordinating Council. The data is divided into groundwater quality and groundwater quantity categories. The groundwater quality data is further categorized into long-term/statewide data and short-term/special study data.

* Groundwater Quality Data - Long-term/statewide data

DNR

1. Municipal Water Supply Well Sampling - Water chemistry analysis is conducted for 532 communities every 3 years. Information is available for pH, alkalinity, arsenic, barium, cadmium, calcium, chloride, chromium, copper, fluoride, hardness, iron, lead, magnesium, total residue, manganese, mercury, nitrates, radioactivity, selenium, silver, sodium, sulfate and zinc.

2. Community Wells Other Than Municipal - 900 wells are routinely sampled for inorganics, radioactivity, and bacteria.

3. Noncommunity Wells - 11,500 wells were sampled for nitrates in 1978 and 1979. Five thousand wells with detects are presently being resampled. This resampling will be completed by October 1, 1985.

4. Private Wells - Bacteria samples are taken when the well is installed. Approximately 10,000 wells are installed per year.

5. Volatile Organic Chemical (VOC) Sampling Program - 3,150 wells have been sampled including all community wells and selected private wells where contaminants are suspected.

6. Pesticide Sampling Program - 550 wells (both public & private) have been sampled for various pesticides used near the well.

7. Solid Waste Disposal Sites - 250 sites are monitored quarterly for pH, water elevation, conductivity, COD, alkalinity, dissolved iron, hardness, sodium, chloride, sulfates, boron, and possibly VOCs.

8. Municipal Wastewater Disposal Sites - 69 sites are semiannually monitored for organic nitrogen, ammonia nitrogen, nitrate and nitrite nitrogen, chlorides, sulfates, dissolved solids, alkalinity, hardness, and pH.

9. Industrial Wastewater Disposal Sites - 85 sites are, at a minimum, semiannually monitored for static water level, nitrates, COD, iron, zinc, chlorides, sulfates, dissolved solids, alkalinity, sodium, lead, chromium, hardness, pH, conductance, BOD, calcium, copper, and cadmium.

DILHR

1. Private Sewage Systems Over 8,000 Gallons Per Day - Large systems (approximately 40) are monitored on a semiannual basis for qualitative and quantitative data.

WGNHS

1. Statewide Groundwater Quality (in cooperation with the U.S. Geological Survey) - Water quality samples are collected from approximately 80 wells which are part of a statewide groundwater quality monitoring network.

2. County Resource Inventories - Water quality samples are taken for counties including Rock, Barron, Dunn, Wood, and Chippewa.

UW

1. Private Well Samples - Information from walk-in samples for bacteria, nitrate, pH, hardness, alkalinity, and chlorides is available as well as analyses for approximately 1,000 private wells for bacteria, nitrate, pH, hardness, chloride, iron, and alkalinity.

DHSS

1. Nuclear Power Generating Plants - DHSS monitors the groundwater for radioactivity in the immediate areas (0-10 miles) of operating nuclear power plants.

* Groundwater Quality Data - Short term/special study data

DNR

1. Radioactivity Sampling - All municipal wells and an additional 290 wells in areas where radioactivity is suspected have been sampled.

2. Aldicarb Sampling Program - Approximately 1,000 wells (public & private) have been sampled in areas where aldicarb has been used.

3. Abandoned Landfills - Seven sites are being monitored for various parameters correlating with the type of waste disposal at the site.

4. Environmental Repair Fund Sites - Five sites are being monitored for various parameters correlating with the types of materials present at the sites.

5. Spill Sites - Various parameters are monitored over different periods of time at selected spill sites.

6. Wastewater Disposal Sites - Two industrial and two municipal wastewater disposal sites regulated by the Department are being extensively monitored to determine if existing design and management criteria result in compliance with the groundwater standards contained in NR 140, Wis. Adm. Code.

DILHR

1. Experimental Sewage Systems - All such systems are monitored for qualitative and quantitative data. There are approximately 24 experimental systems in place at this time.

WGNHS

1. Shullsburg Mine Water Contaminant Transport Study - Levels of dissolved sulfate are being monitored and other water chemistry analysis is being conducted.

2. Pesticide Fate Study (in conjunction with DNR) - The effects of varying potato irrigation and cultivation practices on aldicarb movement through the soil and groundwater are being monitored.

UW

1. Small Geographic Area Programs - Eight areas have been sampled for bacteria, nitrate, chlorides, pH, hardness, and alkalinity.

2. Stevens Point Well Field and Recharge Area - 20 wells were sampled in 1984 and 1985 for inorganics.

3. Stevens Point Area - Nine wells were sampled between 1983 and 1985 for inorganics and pesticides.

4. Waushara County - 22 samples have been taken since 1981 for aldicarb, other pesticides, and inorganics.

5. Plover - 15 wells were sampled in 1982 and 1983 for carbofuran, atrazine and inorganics.

6. Nested Wells East of Plover and Whiting - 21 wells are sampled seasonally for inorganics.

7. Drummond Waste Treatment Project - 25 wells were sampled between 1980 and 1984 for inorganics, BOD, and COD.

8. Little Plover River - Eight wells have been sampled to monitor for inorganics and pesticide movements.

DHSS

1. Uranium Exploration Sites - DHSS has conducted groundwater monitoring in areas of northern Wisconsin where uranium exploration has taken place.

DOT

1. Salt Use Monitoring - Three sites (Tomahawk, Endeavor and West Bend) with a total of 14 wells are being monitored for calcium, sodium, chlorides and conductance. In addition, wells at 29 rest areas are tested twice a year for coliform bacteria and 163 wayside wells are tested once a year for coliform bacteria. The DNR also tests these wells for nitrates.

* Groundwater Quantity Data

WGNHS

1. Annual Summary of Groundwater Levels in Wisconsin - Information is available on groundwater level measurements throughout the state since 1980.

2. County Summaries of Groundwater Levels - Information is available on the historical trends of groundwater fluctuations in Marathon, Rock, Juneau, and Calumet counties.

3. Collection of Basic Records on Groundwater Levels (in cooperation with the U.S. Geological Survey) - An observation network of 197 wells is being monitored to provide information on groundwater level fluctuations.

DNR

1. Municipal Water Supplies - The daily pumpage for each municipal well is reported on forms submitted monthly to the DNR. Water levels in each well are recorded at least monthly.

2. High Capacity Wells - The total monthly pumpage and water levels are reported on forms submitted monthly to DNR.

PLANNING AND MAPPING SUBCOMMITTEE

Goal - the goal of this subcommittee is to be the coordinating body for planning and mapping activities conducted by state agencies.

The Planning and Mapping Subcommittee has met twice to determine the issues members want to discuss and to ensure that membership is representative of all the agencies who have planning and mapping responsibilities. The purpose of the subcommittee is to:

- *address the location, timing, and types of county/local based physical resource mapping closely related to groundwater management.
- *ensure state agency resource plans identify and address groundwater management and protection.
- *ensure that county or other groundwater related local plans initiated as a result of state agency programs (e.g. animal waste plans) are coordinated with respect to the timing and substance of the plans and the inventory items contained in each plan.
- *review prototype plans that deal with groundwater management issues.

The activities of the agencies represented on this subcommittee are summarized below. Because this subcommittee is newly formed, there are no specific recommendations to report at this time.

DNR

The DNR is developing a three tier approach to groundwater planning for the state, regional and local levels. The tiers are: a statewide groundwater management plan, groundwater elements in the Water Quality Management Plan updates, and county groundwater management plan.

1. Statewide Groundwater Management Plan: As the name implies, this plan will focus on statewide information and analysis. Existing statewide groundwater management activities, groundwater use, groundwater quality, contamination sources, and data sources will be covered. Information will be analyzed for gaps and overlaps in groundwater programs. In addition, a computerized groundwater susceptibility map is being developed to identify statewide susceptibility to groundwater contamination based on physical resources (see below for further details).

The primary audience for the statewide groundwater management plan will be DNR and other state agency staff and administrators. A popular summary will be provided for more general distribution. Recommendations will be made in the following areas: monitoring, research, data management, interagency coordination, best management practices, and regulatory activities. These recommendations will be combined into short, medium and long-term groundwater management strategies. In addition, critical areas of the state will be identified which need more detailed groundwater planning. The groundwater planning staff have met with DNR groundwater-related program staff and with staff of other state agencies to help develop the goals and objectives of the state groundwater management plan. A detailed plan outline is presently being prepared.

2. Water Quality Management Plan Updates: Previous areawide water quality management plans (WQM) also known as 208 or basin plans have focused on surface water quality.

   A groundwater element in the WQM plan five year updates will provide a regional perspective on groundwater problems and solutions. Water quality management plans have been developed by DNR for 19 major river basins in Wisconsin. In addition, WQM plans have been completed by designated planning agencies in Dane County, Southeastern Wisconsin, and the Fox River Valley. These plans are updated approximately every 5 years. Future WQM plan updates will provide groundwater information and analysis which will translate the statewide groundwater management plan into something more meaningful to local officials.

   For the first round of WQM plan updates, existing information will be adapted to give a regional perspective on groundwater problems. These will focus on program coordination and information and education. Future groundwater elements in WQM plan updates will take advantage of developing groundwater data management capabilities. This level of detail is appropriate for many parts of the state. For some counties the WQM plan updates can be the starting point for more detailed groundwater planning efforts. A prototype groundwater element is being prepared for the Twin-Door-Kewaunee Water Quality Management Plan.

3. County Groundwater Management Plans: Groundwater management plans are being developed in several counties around the state, some by DNR, some with DNR help, and still others on the county's initiative. These counties typically have documented groundwater problems, significant potential for additional groundwater contamination, and the capability and willingness to develop and implement groundwater management recommendations. County groundwater management plans usually involve a cooperative effort between county agencies and state agencies or regional planning commissions. The county has major responsibility for developing and implementing recommendations with technical and planning support from state and regional agencies. Recommendations are typically made in four major areas:

a. Developing contamination source inventories

b. Upgrading of existing government programs with respect to groundwater management

c. Implementing Best Management Practices for site specific land uses and activities

d. Defining area protection approaches for groundwater management. (These protect areas that are sensitive to groundwater contamination due to: geologic and hydrogeologic conditions, proximity to major well fields, or proximity to a particular combination or intensity of contaminating activities.)

Guidance for developing county groundwater management plans is presently being developed by UW-Extension and the DNR Bureau of Water Resources Management. DNR staff are working closely with Marathon County to develop a county groundwater management plan. DNR staff are also helping with the Rock County plan.

Other groundwater planning and mapping activities at the DNR include a groundwater monitoring plan and a groundwater susceptibility mapping project. These are described below.

4. Groundwater Monitoring Plan: This plan guides the Department in its monitoring efforts. This plan is now in the draft stage and will include both long-and short-term objectives. The plan will detail what monitoring has been done to date, what monitoring needs exist, and what steps should be taken to collect the needed data.

5. Groundwater Susceptibility Mapping Project: The DNR, in cooperation with the U.S. Geologic Survey, is mapping, overlaying and rating five physical resource characteristics to determine where groundwater is more susceptible to contamination. Depth to bedrock, type of bedrock, depth to water table, soil characteristics and the characteristics of the unconsolidated materials are the resource characteristics that will be combined and rated to form the final composite map.

In addition, the DNR is involved in various other planning and mapping activities relating to solid waste, water resources, fish and wildlife, wetlands, parks, and forestry. All of these may contain some information relating to groundwater. The types of plans which are probably most closely related to groundwater are described below.

6. County Water Quality and Nonpoint Source Assessments: These assessments are local refinements of the areawide water quality management plans. DNR and County staff identify local nonpoint pollution sources and set priorities for nonpoint source control. Assessments have been completed in Marathon, Lincoln, Brown, Clark, Pepin, and Richland Counties.

7. Nonpoint Source Priority Watershed Plan: The priority watershed program targets specific watersheds to provide cost share dollars for

developing land use controls. One such watershed project in Door County deals specifically with groundwater problems. The Milwaukee River Watershed project will explore, as part of their inventory, the feasibility of incorporating a groundwater element. A detailed implementation plan is prepared for each priority watershed.

8. Sewer Service Area Plan: Areas that are served by a sewage collection system must have plans for how and where sewer service will be provided in the future. Detailed plans have been provided for Janesville, La Crosse, Beloit, Wausau, Marinette, Chippewa Falls-Eau Claire, Hudson, Stevens Point, and Wisconsin Rapids. The plans encourage cost-effective methods of providing public services, protect environmentally sensitive areas and reduce urban sprawl through planned growth.

9. County Solid Waste Plans: These plans were prepared by counties to help them meet their solid waste disposal needs. The plans involve an assessment of existing sites, future waste disposal needs, physical resources to determine where sites can be developed, and methods of reducing waste (e.g., recycling).

WGNHS

The Wisconsin Geologic and Natural History Survey (WGNHS) conducts many groundwater-related planning and mapping activities. Table 7 identifies those projects and their status.

Table 7
WGNHS Planning and Mapping Activities

County	Status	Cooperator(s)	Detail, map types & scales
Brown	WSP 1190, 1953	USGS	Geologic and groundwater maps, usually at a scale of 1:62,500, and a general report. Very little information on water quality.
Outagamie	WSP 1421, 1957	USGS	
Fond du Lac	WSP 1604, 1962	USGS	
Rock	WSP 1619-X, 1963	USGS	
Waupaca	WSP 1669-U, 1964	USGS	
Portage	WSP 1796, 1965	USGS	
Waushara	WSP 1809-B, 1965	USGS	
Winnebago	WSP 1814, 1966	USGS	
Racine & Kenosha	WSP 1878, 1970	USGS	
Door	WSP 2047, 1978	USGS, DNR	
Waukesha	IC 29, 1975	USGS	General geologic and groundwater maps, usually at a scale of approximately 1:300,000 and a general report. Some information on water quality.
St. Croix	IC 32, 1976	USGS	
Jefferson	IC 33, 1976	USGS	
Walworth	IC 34, 1976	USGS	
Columbia	IC 37, 1978	USGS	
Washington Ozaukee	IC 38, 1980	USGS	
Dodge	IC 44, 1983	USGS	

(continued)

Table 7 (continued)

Rock	IC 41, 1982	Rock Co.	Groundwater quality report with general management options
Rock	In press Oct. 1985	Rock Co. DNR, UW-Extension	1:100,000 scale soils general resource, land use and interpretive maps. Detailed g.w. mgt. report.
Forest	In progress (1988)	USGS	1:100,000 glacial map w/o cross-sections. Publication on hold pending incorporation of hydrogeologic data from Exxon site.
Vilas	In progress (1985)	Vilas Co. USGS	1:100,000 glacial map w/cross-sections, water table contour and other maps with general report.
Langlade	In progress (1985)	Langlade Co. Dept. Geology USGS	"
Wood	In progress (1987)	Wood Co. USGS	"
Brown	In Progress (1985)	Brown Co. USGS	1:100,000 glacial map w/cross-sections and other maps. G.W. model & more detailed report. (Separate g.w. recharge model in prep. by Geology grad. student.)
Barron	In Progress (1986)	Barron Co.	1:100,000 glacial map w/cross-sections, water table contour and other maps with general report.
Chippewa	In Progress (1985)	Chippewa	1:100,000 water table contour, soils, water quality summary and short report.
Marathon	In Progress (1986)	Marathon Co. DNR	1:100,000 glacial map w/cross-sections, water table contour and other maps with general reprt. (Proposal to do more detailed report of River Valley Aquifer.)
Portage	In Progress (1986)	DNR	1:100,000 glacial map w/cross-sections and soils map only.
Adams	In Progress (1986)	DNR	"
Florence	In Progress (1986)		1:100,000 glacial map w/o cross-sections. No other maps or report.

(continued)

Table 7 (concluded)

Dunn	Contract negotiations	Dunn Co.	1:100,000 water table contour, soils, water quality and short report.
Ozaukee	Start in Summer 1985	Dept. of Geology	1:100,000 glacial map w/cross-sections.
Juneau	Start in 1986	DNR	1:100,000 glacial map w/cross-sections
Taylor	Has shown interest	Taylor	Glacial map and ?.
Eau Claire	"	Eau Claire U.W.-Eau Claire USGS (?)	1:100,000 bedrock map, soils, water table, & other maps, water quality with detailed study of River Valley aquifer and report.
St. Croix Pierce Pepin	" " "	County and U.W.-River Falls	Fractured rock map, soils, water table, water quality and short report.
Clark	"	Clark Co.	1:100,000 glacial map, water table, quality and short report.
Kewaunee	Has shown interest	Kewaunee	Fractured rock map, soils, water table (?) water quality & short report.
La Crosse	"	La Crosse Co.	"
Oneida	"	Oneida .Co. USGS (?)	1:100,000 glacial, soils, water table, water quality, others, and report.
Polk	"	Polk Co.	?
Burnett	"	Burnett Co.	?
Door	In progress. Non-point watershed study	WG&NHS, DNR. U.W.-Green Bay. SCS?	Door Co. is lead agency. WG&NHS is doing a basin evaluation and may publish the fractured rock and groundwater maps prepared by others.
Portage	In Progress	U.W.-Stevens Pt. DNR, WG&NHS, U.W.-Extension SCS & others	Portage Co. is lead agency. Many resource & land use maps are being prepared.

Note: Fox Valley Water Quality Planning Agency has published a groundwater quality survey of Calumet Co. and is working in Winnebago & Outagamie Counties.

DATCP

The Department of Agriculture, Trade and Consumer Protection (DATCP) is conducting several groundwater planning and management activities.

A pesticide use survey is currently being designed to provide comprehensive data on pesticide use in Wisconsin. This survey will be specifically designed to provide the information necessary for groundwater planning and management on a statewide basis. Detailed information on acreage and amount of active ingredient applied -- by crop and region -- will be gathered for an appropriate list of pesticides. Hopefully, soil texture information can also be incorporated into the pesticide use trends. Statewide totals on acres planted and acres treated with pesticides will also be compiled. This information will be used to determine the effects of proposed regulations and changes in management practices. The pesticide use report should serve other users, and DATCP desires input on the design and objectives of this survey.

In addition to the pesticide use survey, DATCP hopes to compile within the next year, a list of all pesticide dealers and commercial applicators in the state. An attempt will be made to include appropriate information on past history of spills or other relevant handling problems. This compilation could be mapped on a statewide, county or susceptible groundwater areas basis, and used to guide future monitoring and other groundwater management activities.

DATCP is also engaged in animal waste management through the Wisconsin Farmers Fund Program, which is aimed at preventing water pollution problems. The Wisconsin Farmers Fund provides cost-share grants to assist farmers in improving the management of animal waste on their farms, and assistance is targeted to areas with the greatest potential for improvement in water quality. DATCP has the primary responsibility to implement this program, but administration of the program is a combined effort between the state and participating counties.

DATCP has placed a high priority on a strategy for reducing potential adverse impacts on groundwater quality from certain animal waste practices. This strategy is two-fold. The first part consists of a preventative approach for minimizing adverse impacts animal waste storage facilities may have on groundwater. It consists of working with County Land Conservation Departments to develop and implement ordinances which require that earthen storage facilities for animal waste meet minimum site, design, and construction standards. At the counties' option, other types of storage facilities for animal waste may be included in the ordinance. This ordinance must be in place prior to a county being eligible for the Wisconsin Farmers Fund Program.

The second part of DATCP's strategy for animal waste related groundwater protection is currently being developed through a joint project between the DATCP, Portage County, and the University of Wisconsin - Stevens Point. The College of Natural Resources at UW-Stevens Point is taking a lead effort in developing a model county animal waste management plan which focuses on the groundwater issues from a barnyard management

standpoint. The model plan will have two components. The first component consists of methodology being developed by the College of Natural Resources to prioritize areas within county boundaries which may be susceptible to adverse groundwater impacts due to sensitive soil or bedrock conditions. The second component consists of developing a methodology for evaluating or investigating a specific barnyard to determine if it has a potential for adversely impacting groundwater. It is anticipated this evaluative tool will be useful not only to Portage County and the DATCP, but also to DNR for their animal waste related activities.

UW

The University of Wisconsin campus units and Extension programs are not planning organizations. However, units of the University have a long history of education, basic and applied research, inventory and analysis, and technical assistance in areas related to groundwater management that have a bearing on groundwater planning. Extension faculty affiliated with University of Wisconsin-Madison and University of Wisconsin-Stevens Point have been most actively conducting programming including: general groundwater education about the resource in our state; groundwater resources inventories and assessments, resource information management and special studies (being conducted by the Wisconsin Geological Survey in cooperation with faculty from several units in a number of counties and communities); agricultural cropland and livestock waste management; technical assistance to local governments undertaking groundwater management programs; on-site waste disposal; and solid and toxic waste management. Program outputs range from movies, slide sets, pamphlets, demonstrations, and learning experiences for the public at large, to tailored technical and educational assistance to specific counties (e.g., Rock, Portage, Marathon, Door, Barron) in developing protection and management programs.

UWEX has conducted training programs for specialists and community-based faculty, who in turn play major roles in planning activities related to groundwater management. Particular emphasis has been given to providing educational and technical assistance (in collaboration with other state and local agencies) to local governments undertaking groundwater protection planning and management programs.

Faculty assistance has been available to identify and review local land use, zoning, and regulatory options for groundwater protection. A draft publication "Groundwater Protection Through Local Land Use Controls" will be published in final form in late 1985. In collaboration with DNR, a groundwater planning manual for local governments is being prepared. A series of seven monthly ETN programs on groundwater management issues was held during the academic year and five regional meetings were held around the state; these sessions involved 325 local elected officials and resource technicians. Hydrogeological and engineering assistance were provided to delineate of a well recharge area and cone of depression for the municipal wellfield in the Town of Rib Mountain. This, along with legal and planning assistance in the form of appropriate land use

restrictions, will make Rib Mountain the first community in Wisconsin to adopt a well protection district in its zoning ordinance.

DILHR

In reviewing plans for large scale private sewage systems (>8,000 gallons per day), DILHR is responsible for assuring that these systems are located in areas that are consistent with existing sewer service areas as designated in the areawide water quality management plans.

DILHR also is responsible for providing information and making recommendations for soil survey mapping, map use and map interpretation through its association with the interagency soil survey group.

Regional Planning Commissions

Regional Planning Commissions (RPC) were polled to determine what types of groundwater related planning and mapping activities they were involved with. The following is a summary of information provided by the Mississippi River RPC, Northwest Wisconsin RPC, West Central Wisconsin RPC, East Central Wisconsin RPC, Southeast Wisconsin RPC, Southwest Wisconsin RPC, and the Fox Valley Water Quality Planning Agency.

RPC's, as their name implies, are involved with developing plans including land use, solid waste, farmland preservation, outdoor recreation and open space, priority watershed, areawide water quality management, and county groundwater management.

The RPC's also reported various groundwater-related mapping that accompanied their planning activities. Some of these activities include mapping land uses, identifying and mapping groundwater levels based on well construction reports, identifying and mapping bedrock and glacial geology, soils, and other physical resource information.

EDUCATION SUBCOMMITTEE

Goal - Develop a public education initiative that will provide state residents with the information they need to understand and participate in the management of Wisconsin's groundwater.

The Groundwater Coordinating Council Education Subcommittee met on June 27, 1985 to discuss developing the subcommittee's report for the Groundwater Coordinating Council's annual report to the Legislature. It was determined that the subcommittee report will list educational activities which have been and are being conducted by the University of Wisconsin System, the Wisconsin Geological and Natural History Survey, the Department of Natural Resources, and the University of Wisconsin Extension Service.

It was also recommended that following a listing of activities, a general statement assessing the extent and appropriateness of activities would be developed. The analysis conducted in developing this assessment statement would then provide the basis for making recommendations regarding additional educational needs. This report does not represent educational activities with the Department of Public Instruction, the vocational, technical, adult education program, or programs conducted in parochial schools. A summary of agency educational activities follows.

UW

The University of Wisconsin System, through its institutions, offers credit instruction related to groundwater in courses, sequences of course work and/or independent study that are within several degree programs. However, there are no degree programs formally titled as Geohydrology, Hydrogeology or Groundwater Management.

Programs that may include, or in some cases require, the study of groundwater or its management follow:

1. Baccalaureate programs in Geology at Eau Claire, Oshkosh, Parkside, Platteville.
2. Baccalaureate and Master's programs in Geological Sciences at Milwaukee.
3. Baccalaureate program in Geology and Geophysics at Madison.
4. Master's and Doctoral programs in Geophysics at Madison.
5. Baccalaureate programs in Earth Science at Madison, Green Bay, Oshkosh, River Falls.
6. Doctoral program in Geosciences at Milwaukee.
7. Baccalaureate programs in Earth Science at Madison, Green Bay, Oshkosh, River Falls.
8. Baccalaureate program in Water Resources at Stevens Point.
9. Master's program in Water Resources Management at Madison.
10. Baccalaureate, Master's, and Doctoral programs in Agricultural Engineering at Madison.
11. Baccalaureate, Master's and Doctoral programs in Engineering at Madison.
12. Baccalaureate program in Soil and Crop Science at Platteville.
13. Baccalaureate programs in Soil Science at Madison, River Falls, and Stevens Point.
14. Master's and Doctoral programs in Soil Science at Madison.

UWEX

The University of Wisconsin Extension system has redirected existing staff resources to develop seven identifiable programs related to groundwater quality.

1. Basic groundwater education.

2. Drinking water quality education.

3. General groundwater resource evaluation - including identifying areas of high groundwater pollution potential.

4. Legal options for protecting and managing local groundwater resources.

5. Irrigation scheduling to protect groundwater.

6. Livestock waste management to protect groundwater.

7. Solid waste management to protect groundwater.

Many education programs for citizens and local officials have been conducted on these topics.

Other education activities modified to create a greater recognition of the relationship of management practices to groundwater quality include:

1. Modifying the pesticide certification training program to identify the relationship of proper pest management to surfacing groundwater pollution.

2. Recognizing the relationship of fertility management programs to the potential of nitrate contamination of groundwater.

3. Recognizing that integrated pest management programs can significantly effect the potential for groundwater contamination.

A summary of the above programs and the information and education materials which have been developed to support implementation of these programs are included in Appendix B.

WGNHS

1. W85 010 Groundwater Levels in Wisconsin: County Summaries: This continuing project is designed to distribute information on groundwater levels and their fluctuations. Pamphlets are developed periodically for a county and contain a brief explanation of the most common misconceptions about groundwater occurrence and movement, a summary of well depths and depth to water, and various graphs showing the historical trends of water level fluctuations. Since 1980, pamphlets were published for Marathon, Rock, and Juneau Counties. Another one, for Calumet County, is in preparation.

2. W85 022 Groundwater Educational Brochures: General information about the groundwater of Wisconsin is needed for the public and for educators. As part of this project, research and other information will be published in a format suitable for general audiences. Publications will be distributed by the GNHS, UW-Extension, and DNR. In addition, demonstration models, movies, slide/tapes, and other educational tools will be developed to illustrate principles of groundwater movement and distribution.

3. W85 023 Guide to Wisconsin's Groundwater Information: The GNHS is cooperating with the USGS on a comprehensive reference book which will provide basic information on the occurrence, movement, quality, and use of groundwater in Wisconsin; availability and use of groundwater data; and agencies that supply basic research data.

4. W85 024 Bibliography and Index of Wisconsin Groundwater: The objective of this continuing project is to systematically collect literature references on groundwater in Wisconsin and periodically publish bibliographic updates. The supplement for 1978-1983 was published in 1984. This and all the previous entries (1834-1972 and 1973-1977) are being computerized now and a complete groundwater bibliography for 1834-1984 will be published in a single volume during the next biennium.

5. W85 025 Guide to Groundwater Monitoring Techniques in Wisconsin: In recent years the GNHS has received repeated and varied requests for information on monitoring groundwater quality and groundwater flow near waste disposal facilities, well fields, and contamination sites. This groundwater monitoring guide will summarize the technical considerations needed in designing a monitoring program and will contain state-of-the-art information on monitoring technology applicable to Wisconsin. The guide will be of use to regulatory officials, private organizations, students, and others interested in groundwater monitoring.

6. W85 028 Groundwater-Wisconsin's Buried Treasure: GNHS cooperated with the Department of Natural Resources on the publication of a supplement to the "Natural Resources" magazine published by DNR. Since that publication, a bill has been passed by the Wisconsin Legislature designed to protect the state's groundwater. This project is designed to revise and update the brochure titled "Groundwater-Wisconsin's Buried Treasure."

DNR

1. Developed a quarterly newsletter titled "Groundwater Report" which explains various groundwater activities including the groundwater legislation and subsequent rule development.

2. Cooperated with the Wisconsin Geological Natural History Survey and University of Wisconsin-Extension in the development of a slide-tape program on groundwater.

3. Published a special supplement to the Wisconsin Natural Resources magazine entitled "Groundwater-Wisconsin's Buried Treasure."

4. Published a fact sheet on "Most Asked Questions About Groundwater."

5. Cooperated with the Wisconsin Geological Natural History Survey and the University of Wisconsin-Extension in the developing a poster on groundwater and land use in the water cycle.

6. Developed a 30 second public service announcement for radio.

7. Developed a 30 second public service announcement for television.

8. Developed a 10 foot exhibit displayed at county fairs, state fair, farm progress days, and the world dairy expo.

9. Conducted two workshops for interested citizens sponsored by Racine and Kenosha County and Winnebago County zoning administrators.

10. Provided technical assistance to the University of Wisconsin and the University of Wisconsin-Extension for the development of a groundwater film.

DILHR

1. Conducted mandatory continuing education courses for county inspectors (zoning administrators, sanitarians, land use inspectors, and plumbing inspectors). DILHR also provides training for the plumbing and soil testing industries on a voluntary basis.

2. Cooperated with UW-Extension in presenting groundwater seminars for local officials.

3. Participated in UW-ETN programs on groundwater management.

4. Offered continuing education to 250 inspectors on aspects of the new groundwater law, 1983 Wisconsin Act 410.

DHSS

1. Provided citizens, legislators, industry, state governments, poison control centers, and media with toxicological information on groundwater contaminants in private wells and in public water supplies explaining the NR 140 enforcement standards.

2. Participated in community meetings and presented the toxicological and epidemiological aspects of each substance and its importance in a community.

3. Provided consultation to the local governments and their public health staff related to groundwater problems and concerns.

4. Worked with DNR and UW-Extension in the preparation of pamphlets on groundwater contamination and risk assessment.

5. Chaired FSTRAC committee on USEPA-ODW Health Advisory Technical Review.

6. Participated in UW-ETN radio educational series on groundwater management.

7. Invited pesticide companies to meet with state officials to discuss their pesticide product in a pesticide toxicology information exchange series.

Assessment of Education Activities

Education activities which have been conducted to date have resulted in an increase in public awareness and understanding of groundwater contamination problems and concerns. Some education programs are beginning to help local officials and citizens recognize what local regulatory and voluntary actions can be pursued to help protect and manage groundwater resources. Without recognition of this relationship and an understanding of what actions can be taken to protect the groundwater resources it is not likely that substantial local action will be taken to protect groundwater.

A draft of existing educational activities developed by the information and education and training subcommittee of the Legislative Council's Groundwater study committee in 1982, is included in Appendix C. This table identifies the types of education activities being conducted by various agencies that relate to groundwater management. Most of the voids that were identified in the table still exist.

Substantial education activity is being developed and carried out by individual agencies. There is some coordination and cooperation between agencies in the development and implementation of educational materials and programs. However, in many cases programs are developed and conducted independent of any coordination with agencies that have responsibility for groundwater protection and management. A great deal of data is being gathered through groundwater research and monitoring activities. This data is being evaluated and used by agencies in efforts to better understand the extent and nature of groundwater contamination in Wisconsin and to develop policies and administrative rules that will assist in protecting the groundwater resources. Very little of this data is currently used to help citizens who are interested in and concerned about, or affected by groundwater contamination, to better understand and recognize the factors which are causing groundwater contamination, the potential health hazards related to specific contaminants, and what individual and/or local regulatory actions are possible that can assist to alleviate groundwater contamination problems.

Recommendations

1. Substantial need exists to develop coordinated interagency efforts that further enhance local official and individual land manager's recognition of the relationship of land use to groundwater quality.

2. Further analysis of the type of education activities being conducted by agencies should be conducted. The results of this analysis should be used to improve interagency coordination when designing education materials and programs.

3. Major efforts are needed to develop a support mechanism that will facilitate increased local government recognition and understanding of the nature of groundwater protection needs and to facilitate development and implementation of local actions to protect groundwater.

4. Additional research is needed to identify causes of groundwater pollution and practices that can be used to minimize or avoid future pollution.

5. Applied research and demonstration of agricultural practices that have the potential for reducing groundwater contamination should be conducted at field scale to identify those that are most effective and practical.

MAJOR COUNCIL ACTIVITIES

As stated in the Introduction, as of July 1, 1985, the Groundwater Coordinating Council has met three times, and has the following major actions. The Coordinating Council formed four subcommittees: Education; Research; Monitoring and Data Management; and Planning and Mapping. The structure and activities of these subcommittees is discussed in detail in the minutes of those meetings. The Council also adopted a resolution endorsing passage of AB 202, which creates an accelerated and coordinated soil survey program.

Some topics presented to the Coordinating Council include DNR's proposed monitoring strategy for FY 1985-1986, DNR's septage program, EPA's groundwater strategy, and the decisionmaking process used by the Department of Administration when evaluating agency groundwater budget requests.

The minutes of the Council meetings which detail the actions the council took and all of the information presented to them can be found in Appendix A.

ASSESSMENT OF CURRENT MANAGEMENT PROGRAMS

Because of the newness of the Council and its subcommittees, the assessment of current management programs is not complete. The inventory items described above are the first step in assessing management programs. Future reports to the Legislature should provide this assessment.

COUNCIL'S RECOMMENDATIONS FOR IMPROVING GROUNDWATER MANAGEMENT AND PROTECTION

1. The Groundwater Coordinating Council recommends that the Legislature address the problems with septage disposal (wastes pumped from septic and holding tanks), by introducing and passing legislation similar to the septage and sludge management program that was proposed in the Assembly passed version of the 1985-1987 biennial budget bill, but subsequently removed by the Senate.

2. The Groundwater Coordinating Council is concerned that without rapid action by the Legislature, funding for the well compensation program created under s. 144.027, Stats., will end on June 30, 1986, prior to the following activities taking place: the appointment of a Legislative Council committee to study the well compensation issues; the Legislative Council committee making recommendations to the Legislature on the well compensation issue; and the Legislature acting on the recomme3ndations of the Legislative Council committee. The Groundwater Coordinating Council recommends that the Legislature rectify this problem at the earliest possible date so that the citizens of Wisconsin will not be left without adequate compensation, but have recourse should their wells become unfit for use.

3. The Groundwater Coordinating Council recommends that the Legislature address the need for collection of statewide soils information through an accelerated soil survey by passing AB 202 (which was introduced in the 1985 Legislative Session and has not been reported out of Committee) or similar bill.

Groundwater Coordinating Council "Statements of Support"

The Groundwater Coordinating Council has identified and supports (through the development of working subcommittees) the following nonregulatory activities as necessary components of a successful state groundwater managment program: monitoring, planning, data management, mapping, research, and education. In addition, the Groundwater Coordinating Council has specifically highlighted and supports the following activities as they are often not given the full recognition and support that they deserve for their role in groundwater management and protection:

1. The development and implementation of a state groundwater management plan with the cooperation of all state agencies. The council also recognizes the importance of having a component of that plan be dedicated to the role of local government in groundwater management activities; and

2. Basic and applied research targeted to identified needs related to agency groundwater management decisions. The Council recognizes that research is critical for management of the groundwater resource to assure its wise use, protection, and continuing availability to this and future generations.

3899P

APPENDIX A

MINUTES

GROUNDWATER COORDINATING COUNCIL MEETINGS

Minutes of the First Meeting of the
Groundwater Coordinating Council

January 21, 1985

Members present: Lyman Wible (DNR), Bill Schmidt (DHSS), Don Jorgenson (DOT), Bob Ehart (DATCP), Meredith Ostrom (WGNHS), Dallas Peterson (UW), Robert Fuller (Governor's office), Jim Sargent (DILHR).

Others present: Mike Schmoller (DNR), Bruce Baker (DNR), Kevin Kessler (DNR), Robin Schmidt (DNR), Ron Hennings (WGNHS), Tom Dawson (Public Intervenor), Ann Bogar (Legislative Council), Albert Beaver (UW), Henry Anderson (DHSS), Dave Belluck (DHSS), Dave Frederickson (DILHR).

The meeting opened with Lyman Wible briefly discussing the Council's responsibilities and makeup. Each member introduced themselves and Bruce Baker and Kevin Kessler gave a short history of the legislative discussions that led to the creation of the Council. They stated that the Council was created largely as a forum for state agencies to discuss nonregulatory issues. Prior to this Council there had been no formal mechanisms for agencies involved in groundwater management to discuss ideas or problems. Topics such as groundwater resource definition, data management, research, monitoring and education were highlighted as the subjects of most interest to the Council members.

The idea of discussing regulatory concerns was addressed by Lyman Wible. He stated that he had no objections to discussing regulatory issues but that he did not want it to become a major activity of the Council nor did he want the Council to review and evaluate regulatory decisions made by any agency. Bob Ehart agreed saying he did not want the Council to "veto" or approve decisions made by an agency or get involved in second guessing the actions of another department. There was general agreement on this and the Council informally agreed that regulatory issues could be discussed if the situation warranted it.

Robert Fuller began a general discussion of groundwater management in the state. He asked several broad questions about groundwater protection in Wisconsin and asked how the bill effects the management of the state's groundwater. Lyman Wible responded by giving his opinion of what the groundwater legislation achieved. He stated the key component to the legislation is that it sets performance standards that all the state agencies must conform to. The groundwater quality standards are the link between all the regulatory programs and establish a consistent starting point when an agency must take action. Meredith Ostrom followed saying he saw the law as a regulatory response to groundwater management. The standards are regulatory tools to be used by the agencies in carrying out their individual responsibilities. Following this Kevin Kessler and Lyman Wible gave a quick review of the main components of the legislation. Kessler distributed several handouts summarizing the law and gave a description of the monitoring component. Wible then listed and discussed other key components of the bill including:

a) Environmental repair fund
b) Monitoring
c) Well compensation program
d) Standards
e) Septage disposal
f) Groundwater coordinating council
g) Local authorities for groundwater protection

Lyman Wible next discussed staffing for the Council. He said that he would be willing to act as chairperson and that DNR will provide some staff support but that he expected assistance from staff of other members. There was agreement on this point. Following this Wible began discussion of the proposed subcommittee structure.

There was general agreement that subcommittees were needed for monitoring and data management, research and education. There was some feeling that the research and education subcommittees should be separate. Most members were not clear what the planning, mapping and local issues subcommittee was intended to do. Support for this subcommittee was not clear. It was decided that DNR staff would write up 1-2 page description of the goals and functions of each subcommittee prior to the next Council meeting. This would allow each member to comment on the subcommittee structure and decide which subcommittees they would like to be on.

Bill Schmidt asked if we needed a subcommittee to plan the writing of the Council's annual report to the legislature. No clear decision was reached on this point. Following Bill Schmidt's question a general discussion of the annual report and its functions took place. Don Jorgenson, Lyman Wible, Bob Fuller and Dallas Peterson discussed different formats for the report. It was finally decided that DNR staff would provide a draft report outline for the Council to review and discuss at the next meeting.

Bob Ehart raised the issue of tracking what is going on at the national level concerning groundwater management and how it may affect the state. The members agreed and a topic for the next meeting is a discussion of the EPA's groundwater strategy and its implications for Wisconsin.

Don Jorgenson and Meredith Ostrom initiated a brief discussion on what groundwater studies are currently being done in the state. It was decided that each member would bring to the next meeting a list of recent and current work activities and some representative outputs.

Next discussion began on the last agenda topic, each agency's budget requests.

Kevin Kessler briefly outlined DNR's budget request for the upcoming biennium. (see attached sheet).

Dave Frederickson then discussed DILHR's budget requests. For the upcoming biennium DILHR has not requested any new positions for groundwater management. Instead they are waiting for some experience in handling their new responsibilities before requesting any additional resources.

Bill Schmidt reviewed DHSS's budget initiatives. They received two new positions as part of the fiscal note to the groundwater legislation and have requested 4 additional positions for the upcoming biennium. In addition, funding was requested to help create additional toxicological expertise in local health departments and to enlarge the staff support at the State Laboratory of Hygiene.

Don Jorgenson said that DOT has originally requested 9.1 positions to implement the salt storage provisions of the groundwater bill. At this time it appears that all but 1 of the positions have been cut from the budget by DOA.

Bob Ehart stated that DATCP was in the process of hiring the positions allocated to them as part of the fiscal note to the groundwater legislation. In addition he said that their department has requested 5 additional positions for laboratory support for their pesticides and groundwater efforts. At this time they are not sure of the status of this request.

Meredith Ostrom and Ron Hennings briefly outlined the WGNHS budget requests for the upcoming biennium.

Hennings discussed the work funded through the groundwater survey and analysis budget. This is a $610,000 budget administered jointly by the WGNHS and the DNR to fund groundwater related work in research, resource definition, data management and public education. Ostrom outlined a budget request for a shared position between the WGNHS in Madison and the UW-Stevens Point. The position will work largely on educational issues and information exchange between the two locations over a computer link. The status of these requests was not known.

Lastly, Dallas Peterson gave a summary of the budget process used by the UW-System and handed out a decision item narrative outlining and 3 positions and $137,000 groundwater request (see attached sheet). The current status of the request was not known.

Lyman Wible then summarized the entire meeting, thanked everyone for their participation and asked when the next meeting date should be. The next council meeting will be March 1, 1985 in room 011 of GEF III, Madison. The meeting will begin at 1:00 p.m.

4469V

PROGRAM: DEPARTMENT-WIDE

SUBPROGRAM: DEPARTMENT-WIDE

DECISION ITEM 6005: GROUNDWATER MANAGEMENT

1985-86	1986-87
$1,097,700 (12.5 FTE);	$1,107,600 (11.0 FTE)

Although 30.5 FTE and substantial monitoring funds were provided in the recent groundwater bill, more resources are required to fully fund the basic monitoring program outlined in the legislation and to implement and enforce the new groundwater standards. The request falls into five categories:

a. Monitoring: 8.0 FTE are required to establish the base level monitoring program on a continuing basis in the Water Supply Program;

b. Analytic Support: $400,000/year in Water Supply, $300,000/year in Water Resources to cover monitoring and testing costs. When added to the base, this makes a total monitoring program of $1,125,000/year.

c. Standards Implementation and Enforcement: 3.5 FTE are requested; 1.5 FTE in Solid Waste, 1.0 FTE in Tech Services to help establish standards and evaluate the importance of soils and disposal sites in achievement of standards, and 1.0 FTE in Environmental Enforcement for groundwater related enforcement.

d. Support: 5.0 new FTE are requested; 2.0 FTE in Information Management to analyze and maintain the groundwater data base, 1.0 FTE in Legal Services for support of legislation and rules related to the groundwater program, and 4.0 FTE Program Assistants for clerical and support services to the over 40 groundwater staff (2.0 FTE frozen by Joint Finance, but in the base, are reallocated for the support services.)

e. Removal of Well Compensation Program: -5.5 FTE (-4.0 Project in 1985-86 and -1.5 Perm in 1986-87) are removed from the department's budget to reflect the one-time nature of the program established by the legislature.

Key elements in the package:

1. Establishing groundwater protection standards for 200 monitored landfill sites where site plans will be modified to meet specific needs.

2. Replacement of expiring federal funds used on a one-time basis to launch statewide groundwater monitoring efforts.

3. Monitor for contamination in "at risk" private wells in location of immediate suspected problems, planned for launching in 1985-87.

4. Monitor for contamination in up to 4,000 wells for "problem assessment," an early warning system for chemical contamination from chemicals such as aldicarb, pesticides, radioactivity and synthetic chemicals.

Recent DNR survey results indicate potential problems: 1983 volatile organic compound sampling done in 517 public and 55 private wells indicates that 10% have concentrations requiring further investigation; in 1982 DNR sampled 208 wells for VOCs and found 51 had detectable amounts; four towns were forced to close their wells. Numerous problems, some of them serious have been found in public water supplies throughout the state. Communities such as Wausau, Eau Claire, Hartland, Plover and Janesville have been affected. Two thirds of Wisconsin's residents get their water from groundwater; 94% of Wisconsin's municipalities rely on groundwater; there are more than 500,000 wells -- public and private -- in Wisconsin.

3647I

3. Groundwater Management, Research and Extension

a. $137,000 GPR and 3.0 positions for the biennium are requested to provide at the UW-Madison and the Cooperative Extension Service a groundwater research program which, in consultation with citizens, industry, and government agencies, will develop groundwater management strategies to insure the long-term safety and usability of the State's groundwater reservoirs. UW-Madison participants will include faculty from Agricultural and Life Sciences, the Geological and Natural History Survey, Civil and Environmental Engineering, Urban and Regional Planning, Geology, and the School of Law. The Cooperative Extension Service will provide an opportunity for participation by faculty from such institutions as UW-Stevens Point and UW-Green Bay, will develop research-based Extension programs which integrate institutional activities but maintain statewide leadership, and contribute field experience and information on the practical groundwater problems in Wisconsin.

Coordination of research and extension organization has proven a highly successful approach with other programs. It is flexible; it is responsive to State needs; it develops and utilizes science to deal with contemporary problems; and it brings a variety of disciplines to bear upon the problem.

b. Pure groundwater is important to Wisconsin agriculture, industry and individual citizens. Ninety-four percent of the State's cities and villages get their drinking water from the ground, and 25 percent of Wisconsin's manufacturing needs for water are met from aquifers. In particular, the pulp and paper, fruit and vegetable processing, cheese-making, electroplating, meat processing and brewing industries are large users of high quality water. Agriculture, likewise, is an increasingly heavy user of clean groundwater, not only to maintain the Grade-A milk rating but to supply the growing demand for irrigation.

A wide variety of chemicals used in agriculture, industry, and for other purposes such as salt for road de-icing, are finding their way into the groundwater. In the irrigated sandy areas of Central Wisconsin, nitrates from fertilizer and animal wastes, pesticides from intensive irrigated agriculture, toxic chemicals from waste dumps, storage areas, landfills, and petroleum are possible sources of groundwater contamination, if proper management does not take place.

(Total biennial request: $137,000 GPR; 3.0 FTE Positions)

Research Subcommittee

Goal - to prepare a research plan that identifies the most important groundwater research needs in the state, estimates the fiscal requirements to meet those needs, and influences decisionmaking in the budget process.

Discussion - there are many unknowns involved in determining how contaminants move from the land surface to groundwater. Also there are many unknowns in understanding the basic properties of Wisconsin's groundwaters. To better protect and manage the state's resources a focused applied research effort is required. The role of the subcommittee should be to identify agency research needs and then prioritize those needs if possible. The resulting information could be used by legislators and agency administrators in making resource allocation decisions. The following topics have been identified as priority concerns by past groups and should be addressed by this subcommittee:

a) environmental fate of contaminants in the soil and groundwater.

b) toxicological properties of contaminants and their breakdown products.

c) the interactive toxic effects of multiple substances in drinking water.

d) the physical and chemical properties of geologic materials and groundwaters.

Tasks -

a) prepare a report to the full Council by June 1, 1985 that outlines a prioritized research plan with accompanying fiscal estimates.

Education Subcommittee

Goal - to develop a public education initiative that will provide state residents with the information they need to understand and participate in the management of Wisconsin's groundwater.

Discussion - developing a public understanding of the complex and often confusing ideas concerning groundwater is essential for public support of a groundwater management program. Currently there are a number of ongoing state efforts involved in public education. However, often these efforts overlap or are not well coordinated. This subcommittee should be the exchange point where agencies can find out what programs others are carrying out. Also this subcommittee should develop ideas for new initiatives in education. Support of this subcommittee and the Council as a whole should be used to back budget requests made for educational activities.

Tasks -

a) prepare an inventory of current education projects.

b) assess ongoing activities and determine additional needs or overlaps.

c) prepare a plan for future educational programs and an estimate of the fiscal requirements.

d) submit a report detailing the above ideas to the full Council June 1, 1985.

Monitoring and Data Management Subcommittee

Goal - 1) to develop an integrated groundwater monitoring plan that most efficiently uses available resources to provide the information needed to manage and protect groundwater resources.

2) to propose a plan for establishing a data management system that insures state agencies can access accurate up to date information on the state's geology and groundwater resources.

Discussion - the need to coordinate groundwater monitoring and data management activities is obvious. In the upcoming biennium the DNR plans to spend approximately $1.8 million on laboratory contracts for groundwater analyses. The data collected by these efforts is important to the regulatory programs in a number of state agencies. The subcommittee should concentrate insuring that monitoring and data management efforts are mutually reinforcing. To date the DATCP, DNR and WGNHS have worked well together in organizing and carrying out monitoring projects. This type of close coordination needs to be expanded to include all departments.

Tasks -

a) inventory existing monitoring programs and identify any gaps or overlaps.

b) prepare a monitoring plan that coordinates ongoing programs, establishes new initiatives and addresses the fiscal needs of the proposal.

c) work closely with existing groups already addressing data management issues to develop an acceptable approach to the problem.

d) report to the full Council on June 1, 1985 on the work done.

Groundwater Planning and Mapping Subcommittee

Goal - the goal of this subcommittee is to be the coordinating body for planning and mapping activities conducted by state agencies.

Discussion - many state agencies are involved in planning and mapping activities. At the request of Rock County officials, the DNR, UW-Extension, and WGNHS are currently working with Rock County officials in developing a County Groundwater Management Plan. One of the objectives of the plan is to assist local officials in preparing ordinances to protect groundwater

quality. In addition, a groundwater contamination potential map, based on soil and geologic conditions, is being produced. This map will help county officials identify those areas most in need of enhanced protection measures.

However, not all planning and mapping efforts are as well coordinated between state agencies as was for Rock County. Often, one department does not know where others are or will be working. Consequently, activities can unknowingly overlap, wasting resources, or worse, making conflicting recommendations to the same local officials. This subcommittee should take the responsibility for ensuring more efficient planning and mapping efforts occur.

Tasks -

1) Identify agencies responsibilities and objectives in conducting planning and mapping activities, and identify current planning and mapping efforts.

2) Develop a mechanism to coordinate these ongoing and future planning and mapping efforts.

3) Report to the full Council by June 1, 1985 as the progress of the subcommittee's work.

Minutes of the Second Meeting of the
Groundwater Coordinating Council

March 1, 1985

Members present: Lyman Wible (DNR), Bill Schmidt (DH&SS), Meredith Ostrom (WGNHS), Robert Fuller (Governor's Office) and Ed McClain (DILHR).

Others present: Mike Schmoller (DNR), Bruce Baker (DNR), Al Lulloff (DNR), Kevin Kessler (DNR), Al Fish (DOA), Steve Shober (DOT), Bob Patenaude (DOT), Ron Hennings (WGNHS), Dave Frederickson (DILHR), Sam Sinha (DH&SS) and Al Beaver (UW).

Lyman Wible opened the meeting and the minutes of the last meeting were approved with little discussion.

Al Fish gave a short presentation regarding the DOA budget process. He gave a quick summary of some new ideas in the proposed budget. The specifics discussed include:

1. An increase in the tipping fee from $.10 to $.30 per ton. The increase was based on the idea that landfills are significant sources of groundwater pollution and as a result should bear a portion of the cost of protecting the resource. It is expected that this proposal will face considerable opposition in the legislature.

2. An additional $1.4 million for the biennium is proposed to be added to the groundwater fund from general purpose revenues (GPR). Use of GPR funds in the groundwater fund was justified on the basis that groundwater protection is a public benefit and as such deserves the use of GPR dollars.

3. $3.0 million dollars is proposed to be used from the groundwater fund for the environmental repair fund. The dollars will be used for investigation at leaking landfill sites.

Following the presentation there was a general discussion of the budget. Specifically, Meredith Ostrom raised the point that funding for an accelerated soils mapping program would be requested during the legislative budget process. Lyman Wible asked if the council should officially support the request. After discussion it was decided that the research subcommittee should review the issue.

The next subjects discussed were the proposed subcommittee structures.

Kevin Kessler briefly presented the research subcommittee proposed structure. In the discussion Al Beaver questioned the role of the subcommittee in reviewing research proposals that did not involve state funds. He did not believe the subcommittee should review all research activities rather he believed the subcommittee should limit itself only to state funded projects. After some discussion this idea was agreed to. Kevin Kessler proposed that the research budget being developed by the Water Resources Center be brought to the Council for review. The idea was supported by the Council as a whole.

The research subcommittee proposal was approved with the following changes:

1. Under activity d) the words, "distribution of and" should be inserted after the.

2. The subcommittee's review role would apply only to state funded projects. Review of other than state funded projects would be done only upon request.

Next Kevin Kessler presented the education subcommittee proposal. The proposal generated some discussion. The main point made was the need to include consideration of delivery systems to get information out to the public.

The subcommittee proposal was adopted with the following change:

1. In activity c) insert, "including delivery systems" after the word programs.

Next Kevin Kessler present the monitoring and data management subcommittee outline. Al Lulloff (DNR) gave a quick review of some of the Department's data management activities. Discussion of this subcommittee focused largely on data management concerns. The subcommittee proposal was approved as proposed.

Lastly, Kevin Kessler presented the planning and mapping subcommittee. There was little discussion. The proposal was accepted as written.

After all the presentations the Council as a whole accepted the subcommittee structures as modified. Membership on the subcommittee is open to all Council members and staff from the represented agencies. Members can serve on any or all of the proposed subcommittees. Interest in serving on a subcommittee should be made in writing to Michael Schmoller, DNR on or before April 15, 1985.

After the subcommittee discussions, Carl Blabaum, Director, Bureau of Wastewater Management gave a presentation on the Department's proposed septage control program. The agenda item was added as a result of interest shown by Council members about the problems associated with septage management (attached is a summary of the Department's proposed efforts). Carl highlighted some of the current problems and the new roles for counties envisioned by the Department. There was some discussion of the problem and proposed ideas.

Next Kevin Kessler presented the proposed report outline. The Council is responsible to report to the legislature in August, 1985 on the activities of the Council. Dave Frederickson gave a number of comments as to what needs to be added to the report. Based largely on his comments, a revised outline will be written and included with these minutes (see attached outline).

Lastly, Bruce Baker gave a very quick summary of some of US EPA's latest groundwater related actions. The most important new development is in the field of leaking underground storage tanks for petroleum and other chemicals. In Wisconsin, these new responsibilities will be shared between DNR and DILHR.

After discussion Meredith Ostrom requested that an agenda item for the accelerated and mapping budget initiative be placed on the next meeting agenda. This was agreed to and the meeting was closed.

5572W

Minutes of the
April 29, 1985 Meeting
Groundwater Coordinating Council

Members Present: Lyman Wible (DNR), Bill Simmons (DATCP), Meredith Ostrom (WGNHS), Ed McClain (DILHR), Robert Fuller (Governor's Office).

Others Present: Kevin Kessler (DNR), Bruce Baker (DNR), Dave Belluck (DHSS), Frank Jones (DATCP), John Brasino (UW-Madison), John Hoopes (UW-Madison), Jeff Hyman (UW-Madison), Jeff Postle (DATCP), Cathy Endres (DATCP), Dave Fredrickson (DILHR), Ron Hennings (WGNHS), Anne Mauel (DNR), Carol Schultz (DeWitt, Sundby, Hugget, Schumacher, and Morgan).

Lyman asked for a review of the last council meeting minutes. The question was raised if the outline of the annual report was part of the minutes. The council agreed it should be incorporated. An addition was also made to the outline to add II.B to include updates of other ongoing work that the agencies are involved with. (The revised outline is attached.) The minutes with changes incorporated were accepted.

Meredith Ostrom presented an overview of the accelerated soils survey and requested the council to adopt a resolution endorsing passage of AB 202, which creates an accelerated and coordinated soil survey program. Mr. Ostrom presented several reasons for endorsing an accelerated soils survey including: a number of bills may be passed which require soil surveys for administration; 15-20 counties in northwest Wisconsin do not have soil surveys; other areas, specifically southwestern Wisconsin, need updates to incorporate new information. The surveys, as proposed, would have the capability to be updated on a regular basis and would accelerate in expenditures from $50,000 to $500,000 per year for eight (8) years and then taper back to $250,000 per year.

Kevin Kessler wrote a resolution which the council adopted with minor changes. Lyman agreed to follow-up on sending the resolution to the legislature. The resolution, as adopted, is attached to the minutes.

John Brasino, UW-Madison, presented a report on the work he has been doing using a stochastic model to monitor and predict pesticide movement. The work completed in 1984-85 established bromide as an appropriate tracer for aldicarb. The work proposed for 1985-86 includes analyzing affects of various methods of potato culture on transmission rates, varying rates of irrigation in an attempt to lower transmission rates of chemicals, comparing transmission rates between chemical placement on both ridge and furrows, and using the stochastic model to estimate spacial variation and transmission rates. A question and answer/discussion period followed the presentation.

Kevin Kessler and Anne Mauel presented an overview of the DNR's monitoring proposal for fiscal year 1985-86. The Department will continue the pesticide and volatile organic compound (VOC) monitoring program with a shift in emphasis from pesticide to VOC monitoring. A list of priority areas for

management practice monitoring as well as specific projects under discussion with various state agencies was also included in the summary. Ron Hennings (WGNHS) suggested concentrating pesticide sampling in fractured bedrock areas and Dave Belluck (DHSS) suggested monitoring aerial application areas. Bob Fuller commented that it is important to have an information packet for people affected by a contamination incident which would explain the risks involved and follow-up actions to be taken.

Subcommittee membership was the next agenda item. (The revised list is attached.) The subcommittees were instructed to meet soon as they are responsible for writing the annual report due in August. DNR was assigned to arrange the first meeting of each subcommittee. Kevin Kessler was assigned to outline dates for drafts. (The dates are included on the attached report outline.) Lyman also instructed the subcommittees to send agendas to the council when time allows.

Lyman called for old business items. Bob Fuller (Governor's Office) inquired as to the status of DNR's proposed septage control program (it is now in a budget bill). Mr. Fuller also volunteered to serve as outside citizen support if needed.

Lyman then called for new business items. Bill Simmons (DATCP) reported that Ag 161, 162, and 163 have cleared the policy board and will go to the legislature for approval. He noted that the present time frame will allow for only one construction season to get into compliance and this may cause an economic hardship for some.

Ron Hennings (WGNHS) noted that the survey will move to 3817 Mineral Point Road on June 24 and that the 1-24,000 topographic mapping series is now complete.

It was decided to schedule the next meeting after the subcommittees have met. The meeting was then adjourned.

6046A

ANNUAL REPORT OUTLINE

I. Introduction

A. Brief discussion of the Council's make-up and activities for the first year.

II. Council Activities

A. Subcommittee Reports and Recommendations

1. Research

2. Education

3. Monitoring and Data Management

4. Planning and Mapping

B. Report by each agency of other groundwater related regulatory activities they are responsible for.

III. Condition of the State's Groundwater Resource

A. Current Problems

B. Anticipated Problems

C. Assessment of Current Management Programs

IV. Council's Recommendation for Improving Groundwater Management and Protection

July 15 - Subcommittee draft for review and comment to Council

Aug 15 - Final report to be adopted by Council

Aug 31 - Report due to Legislature

6046A

Wisconsin Groundwater Coordinating Council
Subcommittee Members

Research

DNR - Mike Schmoller
UW - To be assigned
DATCP - Frank Jones
DHSS - To be assigned
DILHR - Dave Fredrickson
WGNHS - Ron Hennings

Education

DNR - Rudy Teschan
UW - To be assigned
Governor's Office - Robert Fuller
WGNHS - Ron Hennings

Monitoring and Data Management

DNR - Al Lulloff
DOT - To be assigned
WGNHS - Ron Hennings
DATCP - To be assigned
DILHR - Jim Wilson

Planning and Mapping

DNR - Anne Mauel, Robin Schmidt, Steve Skavroneck
WGNHS - Ron Hennings
UW - To be assigned
DATCP - Jeff Postle

6046A

Wisconsin Groundwater Coordinating Council Resolution

Whereas the Groundwater Coordinating Council is created under s. 15.347(13), Stats., to include representatives of state agencies with responsibility for groundwater management; and

Whereas s. 160.50(1), Stats., requires the Groundwater Coordinating Council to "serve as a means of increasing the efficiency and facilitating the effective functioning of state agencies in activities related to groundwater management"; and

Whereas soil survey information is needed for state and local decisions related to groundwater management including protection of water supplies, use of pesticides and fertilizers, private sewage system siting, industrial development decisions, land application of sewage and sludge, animal waste disposal and industrial waste disposal; and

Whereas current or proposed budgets of administrative agencies have never included allocations for the statutorily mandated completion of soil surveys; and

Whereas 1985 Assembly Bill 202 would create, under the direction of the Wisconsin Geological and Natural History Survey, an accelerated and coordinated soil survey program for the State of Wisconsin;

Now therefore be it resolved that;

1. The Groundwater Coordinating Council endorses and urges passage of AB 202, as drafted including the provision of General Purpose Revenues, and

2. Copies of this resolution be sent to the appropriate standing committees of the legislature.

Dated at Madison, Wisconsin, this 29th day of April, 1985

Groundwater Coordinating Council

By

Lyman F. Wible

Lyman F. Wible, Chairman

6046A

Minutes of the August 7, 1985 Groundwater Coordinating Council Meeting

Members Present: Bruce Baker representing Lyman Wible, WDNR; Ed McClain, DILHR; Ron Hennings representing Buzz Ostrom, WGNHS; Bill Schmidt, DHSS; Don Jorgensen, DOT; Al Beaver representing Dallas Peterson, University of Wisconsin; Bob Fuller, Governor's Office.

Others Present: Kevin Kessler, DNR; Dave Fredrickson, DILHR; Anne Mauel, DNR; Robin Schmidt, DNR; Mickey Palo, Infomatics General; Alan Lulloff, DNR; Steve Skavroneck, DNR; Robert Patenaude, DOT; Jeff Postle, DATCP; Frank Jones, DATCP; Dave Lindorff, DNR; Jim Wilson, DILHR; Gary Jackson, University of Wisconsin Extension; Sam Sinha, DHSS; Mark Horwitz from U.S. EPA; Rudy Teschan, DNR; Carol Schultz, DeWitt, Sundby et. al.; and Tom Dawson, Department of Justice - Public Intervenor.

Bruce Baker called the meeting to order. The 4/29/85 minutes were approved without discussion.

Each agency represented on the Council then presented a report of the current groundwater management activities.

DNR - Reported by Kevin Kessler

- NR 140 has completed the Legislative review process and been sent to the Revisor of Statutes.

- The Department monitoring plan is almost completed. Included in this is a description of management practice monitoring contracts. Some of these contracts include projects in conjunction with DATCP, University of Wisconsin and WGNHS.

- The Statewide Groundwater Management Plan has reached the stage where a list of products has been developed based on the revised goals and objectives. Each of the products has a schedule for completion. The Department will be setting up meetings with each state agency in the near future.

- County groundwater management plans are being produced for both Rock County and Marathon County.

- The budget bill included appropriations for the continued expansion of monitoring activities. The Governor, however, vetoed the second year of funding for the well compensation program.

DILHR - Reported by Dave Fredrickson

- The Governor designated DILHR as the lead agency for the underground storage tank program. The Department is in the final phases of finishing a grant application for $125,000 to assist in establishing the new program areas.

- The second draft of rules dealing with underground storage tanks will be scheduled for hearing in October or November. An early 1986 implementation date is expected. The rules include provision for a registration system that goes beyond the underground storage tank inventory and includes groundwater protection aspects.

- The Memorandum of Understanding supplement with DNR on large private sewage systems has been completed. This includes systems over 8,000 gallons per day. The supplement contains monitoring aspects for these systems.

- DILHR adopted emergency rules on holding tanks. This allows DILHR to impose restrictions in an area against holding tanks where they are a problem.

- The Department started negotiations for a Memorandum of Understanding with DNR on use and approval of home water treatment systems. A device for aldicarb treatment has been approved. Union Carbide will provide maintenance for the aldicarb treatment systems.

- The budget bill appropriated 2 positions to DILHR for regulation of underground storage tanks and $50,000 for the small scale waste management project.

- At a recent Legislative Council meeting, legislative changes recommended by the special committee on private sewage systems was not approved to be introduced. This proposal included tighter enforcement language for counties.

DHSS - Reported by Sam Sinha

- The Department has finished a document describing 36 compounds for which groundwater standards will be established and added 12 more substances to the list.

- The Department is looking at the effects of VOC's in community water systems. This includes investigating sources of VOCs in the groundwater and investigating synergistic effects of compounds. EPA has invited two toxicologists to Washington for a three weeks training session to learn risk assessment for each compound.

- Sam emphasized that the Council should consider involvement with industry and local governments so that they all become a part of the overall state groundwater management programs.

University of Wisconsin - Reported by Gary Jackson

- The budget request included positions for staffing the Extension Groundwater Information and Education Center. This center will be located in central Wisconsin. It's intent is to collect and organize data being gathered by various agencies into one system. The combined data can then be used to develop information and education programs. Several staff positions may be linked back into WGNHS as they have record keeping responsibility. The purpose of the center is to identify problems, to get

more information out to citizens, and to assist in solving groundwater management problems. The project will involve other agencies. Ron Hennings added that its really a continuation of what's been going on in the past. It will serve a field office. The project will also work in conjunction with the SCS Golden Sands RC&D.

- University of Wisconsin Extension is involved in a contract with DNR to do a literature search for best management practices for agricultural activities including livestock waste, pesticides and fertilizers. Doug Yanggen is developing a handbook for local governments to use in groundwater management activities.

- Work is being done in Portage County to develop a groundwater protection and management plan.

- The drinking water education and teaching activities are being continued. At this point Bruce Baker mentioned the need for further discussion on initiative to coordinate all of the ongoing groundwater management activities. The University of Wisconsin Extension's report was concluded with a general discussion by the Council on the need to coordinate activities.

Department of Transportation - Reported by Don Jorgensen

- Trans 277 has been drafted. This is a rule regarding salt storage. A public hearing was held on July 2. Comments from this are being addressed at this time.

- The budget bill included approval of 1 position for administration of regulatory duties relating to storage of chlorides. DOT had requested 9 positions.

Department of Agriculture - Reported by Jeff Postle and Frank Jones

- A pesticide use survey is being conducted to provide data on pesticide use in Wisconsin. The last survey in 1978 focused on general pesticide use trends. The current survey will be more related to groundwater management considerations, by including information on soils and irrigation. They are working with WDNR's groundwater susceptibility maps to relate this survey to physical resource data. The report summarizing this survey is to be completed by approximately January 1987.

- Monitoring activities include a project to study groundwater chemistry and aldicarb degradation rate. They will look in Plover, Wisconsin to see if this is a unique situation or if it's similar to other situations. Also, additional monitoring efforts include a statewide monitoring effort to sample 6 pesticides. Four fields will be monitored for each of the 6 pesticides to determine whether pesticides are contributing to groundwater pollution. The results will allow the Department to determine whether specific rules need to be written for each of the pesticides. Frank also commented that a study is being done by Union Carbide to monitor water supply wells within 500 feet of fields that had aldicarb applied in 1985. There was a general council discussion as to the validity and usefulness of this study.

WGNHS - Reported by Ron Hennings

- Ron mentioned the groundwater recharge and containment studies that are continuing with the University. This is the second year of several studies to measure the effects of groundwater movement and the potential for contaminant transport.

- They are beginning to look at the hydrogeologic properties of glacial materials throughout the state.

- The Rock County groundwater report is in the draft stages and out for review.

- Other county studies are being done and these are listed in the Groundwater Coordinating Council's draft annual report to the Legislature.

- Homemaker program activities are continuing. These include working with county home economic agents or family living agents to do water supply sampling. Homeowners take the water supplies and mail them for lab analysis. Meetings are then held to explain the results.

- Ron also expressed a need for information to homeowners on how to deal with proper disposal of hazardous waste generated in the homes. Bruce Baker suggested that this item be discussed as a separate agenda item at a future meeting.

The next topic was a report by each of the subcommittees on their activities. In general the reports were a synopsis of what was presented in the annual report to the Legislature with the following highlights:

- Research (Ron Hennings, Chair). The long list of needed research was discussed with a decision made that next year's report should include recommendations to the Legislature to pass legislation and appropriate funds for specifically listed research projects. The development of this list of projects would be the subcommittees charge for the next year.

- Mapping and Planning Subcommittee (Robin Schmidt, Chair). The subcommittee reported a need to coordinate with the Monitoring and Data Management Committee in the next year regarding geolocators. The subcommittee's product for the annual report was the inventory of mapping and planning activities done by each of the agencies. The need for a state groundwater management plan was expressed by Bruce Baker and DATCP requested that the subcommittee further explore it's role in the state level groundwater management planning effort. Ed McClain from the Department of Industry, Labor and Human Relations requested that the inventory by the subcommittee also include information from each agency represented on the Council even though they were not represented on the subcommittee.

- Education Subcommittee (Gary Jackson, Chair). Gary summarized the recommendations which are included in the annual report to the Legislature.

- Monitoring and Data Management Subcommittee (Al Lulloff, Chair). Al introduced Mickey Palo as the data management consultant hired to fulfill the groundwater act provision for coordination of data between state agencies. She reported that the inventory of information is almost complete and referenced a memo from Jim Wilson, Department of Industry, Labor and Human Relations. The memo highlighted the fact that this is only a study. That a system would not be developed during the study but rather that the consultant's work will provide guidance on how to set up such a system and what such a system should include.

  The subcommittee recommendation No. 1 was discussed regarding uniform geolocators placed on all data collected. After discussion, this recommendation was modified to read that geolocators would be collected where feasible and that the Monitoring and Data Management Subcommittee would review these issues within the next year. A modification was also placed on the subcommittee's recommendation No. 3 regarding uniform data collection. The modification read that a uniform data collection system would be set up where feasible and that the Monitoring and Data Management subcommittee would review these issues within the next year.

Bruce Baker stated that the focus of the subcommitte for the next year's report should be to look at budget implications of continuing the study to bring it around to actually implementing the suggestions from the study. Jim Wilson added that if the study resulted in recommendations to purchase hardware and software for a merged data base, decisions will have to be made as to who will control the new system and be responsible for inputing and updating the data.

Bruce Baker made a recommendation that the Council direct the subcommittee to act as steering committee for the data management contract. This would involve meeting approximately twice a month until the study was completed which would be in January of 1986. The recommendation was adopted by the Council. Ron Hennings added that the School of Landscape Architecture at the University of Wisconsin-Madison was doing some work on geolocators and that the subcommittee should follow up on this information. Don Jorgensen from DOT and Dave Fredrickson from DILHR also added that the Southeastern Wisconsin Regional Planning Commission and Dane County had sophisticated location information systems in place and these should also be looked at.

Bill Schmidt from the Department of Health and Social Services recommended that the Council recommend to the Legislature that appropriate legislation be passed to tailor a septage disposal system after the private sewage program and create a self sufficient program for allowing local officials to charge fees to cover the cost of administering such a program. This recommendation was adopted by the Council.

Bill Schmidt from DHSS also suggested that the Council address the issue of properly disposing of hazardous waste, particularly those wastes generated by private residences. Bob Fuller recommended that this become an agenda item to discuss at the next meeting. Bruce Baker said he would follow-up on this.

Dave Fredrickson requested that the annual report should list all fees gathered through surcharges for groundwater management programs. This was agreed to by the Council. Tom Dawson from the Department of Justice then proposed 3 recommendations for the Council to consider making to the Legislature. They included:

1. That the Legislative Council should immediately begin its study of the well compensation program and complete the stuay by December 31, 1985 rather than July 1, 1986.

2. That funding for the well compensation program for fiscal year 86-87 should be provided such as by a veto override to the Governor's veto on the funding.

3. That DNR/DOJ should develop a policy on exercising subrogation rights under the groundwater bill to collect monies from the polluters of contaminated wells.

After much discussion the Council agreed to recommending to the Legislature that without rapid action the funding of the well compensation program will end before the Legislature can appoint a legislative council study committee to prepare recommendations and pass appropriate legislation for the continuation of the well compensation program. The Groundwater Coordinating Council further recommended that the Legislature rectify this problem at the earliest possible date so that the citizens of Wisconsin will have recourse should their wells become unfit for use.

Bill Schmidt from the Department of Health and Social Services recommended that the issue of well compensation be discussed at future meetings. Bill also reiterated Sam Sinha's comment that there was a need for the Council to coordinate with industry and local government officials. Kevin Kessler suggested that the copies of the annual report once approved be distributed to local governments and pointed out to the Council that local governments could be appointed as members of subcommittees. Bob Fuller recommended that the Council meet in mid-September. Bruce said he would follow-up on this. The meeting was then adjourned.

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APPENDIX B

INFORMATION, EDUCATION, TRAINING -

LEGISLATIVE COUNCIL GROUNDWATER STUDY COMMITTEE

D R A F T

I N F O R M A T I O N , E D U C A T I O N , T R A I N I N G

Subcommittee of Technical Advisory Committee
to Legislative Council
Groundwater Study Committee

September 22, 1982

APPENDIX I: EXISTING EDUCATIONAL ACTIVITIES

GENERAL CATEGORY	SPECIFIC SITE OR ACTIVITY	TOPIC & SESSIONS OFFERED	# TIMES OFFERED /YEAR	AUDIENCE
Solid and Hazardous Waste	Municipal and Industrial Landfills	UWEX Engineering Sanitary Landfill and Gas and Leachate Management Sanitary Landfill Design Industrial Waste Institute Solid Waste Processing	 1 1 1 1	Engineers and Regulatory Officials
		UWEX Solid Waste Disposal Sites and Siting	On Request	Public
	Open Dumps	None		
	Hazardous Waste Landfills	UWEX Toxic and Hazardous Waste Management and Disposal (includes radioactive waste)	On Request	Public
	Closed Facilities	None		
	Processing and Treatment Facilities (for example, recycling facilities)	None		

GENERAL CATEGORY	SPECIFIC SITE OR ACTIVITY	TOPIC & SESSIONS OFFERED	# TIMES OFFERED /YEAR	AUDIENCE
Solid and Hazardous Waste	Junkyard (Primarily abandoned automobiles)	None		
	Hazardous Waste Generators, Storers and Transporters	UWEX Engineering New Session: Hazardous Waste Management Practices	1	Generators and Handlers
Radioactive Waste	Radioactive Material Handling	UWEX (see solid waste)		Public
Mining	Metallic Mining Prospecting, Exploration, Processing and Waste Disposal	UWEX Sessions on Mining and Groundwater	On Request	Public
		UWEX Engineering Geophysical Prospecting	1	Engineers and Regulatory Officials
	Nonmetallic Mining Activities and Waste Disposal (For example, sand-and-gravel)	None		

GENERAL CATEGORY	SPECIFIC SITE OR ACTIVITY	TOPIC & SESSIONS OFFERED	# TIMES OFFERED /YEAR	AUDIENCE
Industrial Wastes	Industrial Wastewater and Sludge Land Disposal	UWEX Engineering Land Application of Wastewater System Design	1	Engineers and Regulatory Officials
	Water Supply System Backwash Waters	DNR/VTAE Basic and Advanced Waterworks Operator Courses	1	Municipal Employees
	Industrial Wastewater and Sludge Storage Lagoons	UWEX Engineering Industrial Waste Institute	1	Engineers and Regulatory Officials
Domestic Wastes	Septic Tanks Soil Absorption Field and Unsewered Subdivision Review (Plat review)	DILHR Annual continuing education seminars for plumbers & designers	Variable; Approx. 40	Plumbers
		DILHR/UWEX Three types of training sessions for certified soil testers	6	Certified Soil Testers
		DILHR/UWEX Advanced sessions on alternative system design and installation	2 - 4 On Request	Plumbers and Designers
		DILHR Initial and annual mandatory recertification seminars for inspectors	6	County Employees

GENERAL CATEGORY	SPECIFIC SITE OR ACTIVITY	TOPIC & SESSIONS OFFERED	# TIMES OFFERED /YEAR	AUDIENCE
		DILER Mandatory introductory education for restricted plumbing trade	Correspon-dence; On Request	Prospective Plumbers
		UWEX Engineering On-Site Waste Disposal	1	Engineers and Regulatory Officials
Domestic Wastes	Cluster or Small-Community On-Site Septic Systems (large scale systems)	Same as above		
	Septage Disposal	None: New pilot program by DILHR/DNR/UWEX planned		
	Municipal Waste-water and Sludge Land Disposal Operations	DNR Meeting on new developments, policies, and procedures	2	Consulting Engineers and Municipal Officials
		DNR Newsletter		Consulting Engineers and Municipal Officials
		UWEX Engineering Industrial Waste Institute	1	Engineers and Regulatory Officials

GENERAL CATEGORY	SPECIFIC SITE OR ACTIVITY	TOPIC & SESSIONS OFFERED	# TIMES OFFERED /YEAR	AUDIENCE
	Sanitary Sewers	None		
Wells	Drilling and Construction of Drinking Water Wells	DNR Newsletter	---	Statewide
		Public Education Brochures: You and Your Well The Well on Your Farm Safe Water	---	Public/User
		UWEX Drinking Water Testing	---	Public
		Nitrates and Groundwater	---	Public
		UWEX Engineering Environmental Planning for Water Resources	1	Engineers and Regulatory Officials
		Water Pump Selection	1	
		Water Well Design and Construction	1	
		Water Well Hydraulics	1	
		Water Well Drilling for Engineers	1	
	Drilling and Construction of Non-Potable Wells	UWEX Evapotranspiration Rates and Irrigation Scheduling	---	Farmers and Managers
	Drilling and Construction of Test or Monitoring Wells	UWEX Engineering GRD H_2O Quality Protection	1	Engineers, Geologists and Regulatory Officials
		GRD H_2O Modelling Tech's	1	

GENERAL CATEGORY	SPECIFIC SITE OR ACTIVITY	TOPIC & SESSIONS OFFERED	# TIMES OFFERED /YEAR	AUDIENCE
Wells	Well Abandonment	None		
Agricultural	Pesticide Storage, Disposal, Transporation and Use (including private and commercial urban application)	UWEX Pesticides and groundwater	On Request	Public
		Integrated Pest Management	---	County Agricultural and Horticultural Agents, Farmers, Managers and Canning Companies
		Pesticide Applicator Training	---	
		Chemigation Feasibility and Requirements	---	
		Local County Programs; Central Sands radio broadcasts on spray schedules	On request	
	Fertilizer Sale (including lawn and garden sales for private or commercial use)	UWEX Fertigation Feasibility and Requirements	---	Farmers, Growers, Managers, and County Agents
		Irrigation Management	---	
		Soil Testing Practices and Recommendations	---	
		Fertility Management	---	
	Rendering Plants, Dairy Plants, Canning Factories and Livestock Dealers	None		

GENERAL CATEGORY	SPECIFIC SITE OR ACTIVITY	TOPIC & SESSIONS OFFERED	# TIMES OFFERED /YEAR	AUDIENCE
Agricultural	Concentrated Animal Feeding Operations and Waste Handling	UWEX Livestock Waste, Sewage Sludge and Whey Safe Handling & Storage of Manure Land Application of Manure, and Managing Manure for its Nutrient Value Local sessions on non-point source pollution	 --- --- --- On Request	 Farmers Public
	Spills	None		
	Product Storage Tanks (usually commercial) Greater than 5000 gallons for gasoline and fuel oil	DILHR Seminars for tank inspectors Annual fall conference for Inspectors	 Approx. 40 1	 Tank Inspectors; Open to manufacturers and Users
Railyards and Other Loading and Handling Areas	Handling of Potentially Dangerous Materials	None		
	Naturally Occuring Problems	UWEX Env. education sessions	On Request	Public

GENERAL CATEGORY	SPECIFIC SITE OR ACTIVITY	TOPIC & SESSIONS OFFERED	# TIMES OFFERED /YEAR	AUDIENCE
Road Salt	Salt Use and Storage	None		
Cross-Connection Control	Backflow Prevention	DILHR/UWEX Training sessions of Installers and Inspectors	1-2	Installers and Inspectors

APPENDIX C

HOW TO DEVELOP EXTENSION EDUCATION ON GROUNDWATER - UWEX

SOIL AND WATER MANAGEMENT PROGRAMS

HOW TO DEVELOP EXTENSION EDUCATION ON GROUNDWATER

A GUIDE TO AGENT PROGRAMMING

UWEX COOPERATIVE EXTENSION SERVICE • UNIVERSITY OF WISCONSIN-EXTENSION

THE PROBLEM

Residents of rural Wisconsin receive their drinking water from private or municipal wells. Local groundwater quality problems are contaminating an increasing number of these wells. Public concern about these problems has increased. This concern has resulted in new legislation to protect and manage groundwater.

Most groundwater contamination results from local land uses. To be effective in preventing groundwater contamination requires that the relationship of land uses to groundwater quality be recognized so that appropriate voluntary and regulatory actions can be taken to protect this resource.

WHAT EXTENSION CAN DO

Educational needs related to groundwater encompass a wide clientele and cover many technical areas. Extension has an established education system that serves many of these clientele and covers many of the technical areas.

The Extension education network can be effectively used to conduct groundwater education programs or to integrate groundwater information and education into programs and activities that are conducted for farmers, environmentalists, homemakers, and local units of government. Extension education programs do not just focus on raising public concerns through identifying problems. A complete groundwater education program is available to assist with identification of problems or potential problems and the identification of: management practices, technical assistance, financial assistance, or institutional actions which can be used to effectively deal with or prevent the problems.

MATERIALS AVAILABLE

Materials which have been developed are intended to facilitate the development of meetings or workshops, regional conferences, education programs for interested organizations, and distribution of information to individuals who are interested or concerned about groundwater. Printed and audio-visual materials are available that consider information and education needs for clientele from the agriculture/agri-business, family living and community resource development program areas. A complete listing of available materials is attached.

PROGRAM OPTIONS AND SPECIALIST ASSISTANCE AVAILABLE

County faculty can obtain assistance from specialists in developing various groundwater education programs. Specific programs which have been developed and are available are listed below:

1. Groundwater Education Program*
   If we are to use and manage groundwater wisely, every individual who uses groundwater and/or manages the land should have some basic understanding of the nature of this resource. A groundwater film, slide/tape program, displays two dimensional groundwater flow demonstration model (ant farm) and numerous brochures, including a 32-page color booklet have been developed to aid in setting up demonstrations and/or making presentations to groups of interested citizens. Information on the availability of groundwater education materials, groundwater education programs, and/or groundwater education displays can be obtained by contacting Ron Hennings (608) 263-7395 or Gary Jackson (608) 262-1916.

2. Drinking Water Quality Education Program
   Use of the land, waste disposal practices, geology, climate and water use are all integrated into this well water quality program. The goal of this program is to improve the general public's knowledge of the water cycle and the impacts of individual actions on the quality of our water supply. Participant interest and awareness is heightened by review of well water analysis of coliform bacteria, nitrate, chloride and hardness of their own water samples. The test is run through the educational program at a nominal cost to participants. The results of their well water analysis are discussed in the context of local geology, and water conditions. The potential implications of the water test results are reviewed. Contact people include: Jim Peterson (608)262-3799; Ron Hennings (608)263-7395; and Byron Shaw (715)346-3783. Because of the lab capabilities, about 20 workshops for 50 participants each may be conducted in a year.

3. General Groundwater Resource Evaluation -- Including Identifying Areas Of High Groundwater Pollution Potential
   The Wisconsin Geological and Natural History Survey, in cooperation with UWEX, USGS, and DNR will assist two or three counties per year in conducting a countywide groundwater resource evaluation. The evaluation will include several countywide groundwater maps which identify areas of greatest groundwater pollution potential, direction of groundwater movement, potential groundwater yield, etc. Cost to the county may range from $2,500 to $25,000 depending on the availability of information and the level of detail requested. Costs will vary depending on the complexity of the groundwater resource and the level of cost-share assistance obtained from the state or U.S. Geological Survey. Such studies have or are being completed in Vilas, Langlade, Barron, Brown, Rock and Portage Counties. Contact Person: Ron Hennings (608)263-7395.

*Note: Numerous federal, state, local organizations and agencies are involved in groundwater management in Wisconsin. The resources and expertise of agencies such as DNR, Geological Survey, H&SS can be effectively combined with UWEX staff and program materials.

4. Legal Options for Protecting and Managing Local Groundwater Resources

Assistance is available to identify and reviw local land use, zoning and regulatory options which can be used to protect and manage groundwater resources. To effectively use these authorities, it is necessary that there be a good description of the groundwater resource. Without this description, it is difficult to determine the suitability of various areas for activities which may have high potential of contaminating groundwater. For that reason, it is desirable to have a completed groundwater survey to identify areas of high pollution potential prior to indepth review and discussion of legal or regulatory options. Contact person: Doug Yanggen (608)263-5775/262-3603.

5. Irrigation Scheduling

In sand and gravel aquifers where irrigation use is increasing, there is significant potential for nitrate and/or pesticides to leach to the groundwater. Irrigation scheduling can reduce the total amount of water applied to irrigated crops and reduce the potential for materials to be leached to groundwater. A computer program is available to assist growers in scheduling irrigation. This program and information is best suited for use with individual growers and for use at grower meetings or meetings with organizations that work with irrigators. The information may also be effectively integrated into other educational materials for the farm audience. Information on this program can be obtained from Dave Curwen (715)249-5961 or Leonard Massie (608)262-0604.

6. Livestock Waste Management

Water quality problems can result from poorly designed earthen manure storage facilities, improperly managed barnyards, or improper field application of livestock wastes. Educational programs for farm audiences will provide basic information on state programs related to livestock waste management including information on technical assistance, cost-share assistance and regulatory requirements. Information on local regulatory options can be obtained by contacting Doug Yanggen. Information on state policies, technical assistance, storage facility design and management of livestock wastes can be obtained by contacting Jim B. Peterson (608)262-2756.

7. Solid Waste

Poorly constructed and/or operated landfills can lead to water quality problems. Educational programs will provide information concerning safe landfilling, along with alternatives for reducing waste volumes. Technical and legal information is available from Patrick Walsh (608) 262-8179. The UW Department of Engineering offers a series of technical seminars and a separate correspondence course on the design and operation of landfills. For information and fees, contact Phil O'Leary (608)262-0493.

Counties or other units of government that are looking at developing programs to protect and manage groundwater resources would benefit most from developing a coordinated program which would call on each of the elements of this educational program. The program is designed to build a recognition of existing problems, management practices and regulatory options available to address those problems, and preventive actions which can be taken to avoid future problems. In general, the educational offerings provide a constructive, action framework upon which local initiatives can be built to protect and manage groundwater resources.

A GUIDE TO INFORMATIONAL AND EDUCATIONAL MATERIALS ON WISCONSIN'S GROUNDWATER

A number of state agencies and private organizations in Wisconsin have developed informational and educational materials about groundwater. This partial list describes materials thought to be of most help to the citizen interested in groundwater and groundwater quality problems.

Much more information is available in specialized reports and documents. The following state agencies can provide additional information on specific topics.

WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

Information on the geology of Wisconsin's aquifers; maps and special studies on groundwater levels, background quality, occurrence and movement.

DEPARTMENT OF NATURAL RESOURCES

The agency charged with overall management and protection of Wisconsin's groundwater. Information on the state's well code, drinking water standards, results of statewide water quality monitoring, groundwater protection requirements for solid and liquid waste disposal, mining and many other activities.

DEPARTMENT OF HEALTH AND SOCIAL SERVICES

The Division of Health can provide information on the health concerns associated with various drinking water contaminants.

DEPARTMENT OF INDUSTRY, LABOR AND HUMAN RELATIONS

Information on septic system regulations.

DEPARTMENT OF AGRICULTURE, TRADE AND CONSUMER PROTECTION

Information on pesticide use and regulations.

UNIVERSITY OF WISCONSIN - EXTENSION

Publications and educational programs on agricultural practices, water supply, waste disposal and other topics that can assist individuals or units of government to identify problems or potential problems and management practices, technical assistance, financial assistance or institutional actions which can be used to deal with or prevent the problems.

GENERAL GROUNDWATER INFORMATION

GROUNDWATER: WISCONSIN'S BURIED TREASURE, 1983, 32 pages. A detailed look at Wisconsin's groundwater resource: the geology of the state's aquifers, threats to groundwater, management needs. Designed to increase understanding of groundwater among general public, elected officials, students.

Wisconsin Department of Natural Resources, Box 7921, Madison, WI 53707, or Wisconsin Geological and Natural History Survey, 1815 University Ave. Madison, WI 53706

GROUNDWATER STUDY GUIDE, 1984, 12 pages. A study guide for young people (through high school) to be used in conjunction with "Groundwater: Wisconsin Buried Treasure." Includes background information, graphics, suggested projects and field trips, resource people and materials. Can be used by scout and 4-H leaders, classroom teachers and environmental center educators.

Environmental Education Specialist, Wisconsin Department of Natural Resources, Box 7921, Madison, WI 53707

GROUNDWATER PROBLEMS--THIRSTING FOR A SOLUTION 1982, 12 page brochure. A handbook for citizens that reviews sources of contamination, well testing information, sources of additional information, how to cope with a contaminated well, tips for local action on groundwater problems.

Wisconsin's Environmental Decade, 114 N. Carroll St., Madison, WI 53703 (608/251-7020)

AGRICULTURE, OTHER LAND USES AND GROUNDWATER QUALITY

WHEN IT CONCERNS GROUNDWATER--NO ONE CARES MORE THAN THE FARMER, 1983, 16 pages. General discussion of the nature of groundwater, the hydrologic cycle, common groundwater myths, contaminants in groundwater. Explains the role of agriculture and the pesticide industry when the pesticide aldicarb (Temik) was discovered in some Wisconsin wells.

Wisconsin Agri-Business Council, Inc., 2117 Sherman Ave., Madison, WI 53704 (608/241-2197)

NITRATE, GROUNDWATER AND LIVESTOCK HEALTH, 1983, 4 pages. Describes the sources of nitrate in soil and groundwater, potential health effects of nitrate and nitrate on livestock, steps to take if a nitrate problem is suspected or if well water is high in nitrate, and guidelines for use of water with known nitrate content.

County Extension offices or Agricultural Bulletin Bldg, 1535 Observatory Drive, Madison, WI 53706 (608/262-3346) Order #G3217, 15 cents

GROUNDWATER PROTECTION THROUGH LOCAL LAND USE CONTROLS. A detailed discussion of how local zoning and subdivision ordinances can be used to protect groundwater. Identifies specific actions local governments can take, explains relation of local programs to state groundwater authority, and legal basis for local groundwater protection ordinances.

Review draft, expect publication summer, 1985. For review copy and publication status, contact Environmental Resources Center, 216 Agriculture Hall, 1450 Linden Drive Madison, WI 53706 (608/262-0020)

GROUNDWATER POLLUTION PREVENTION IN SOUTHEAST MINNESOTA'S KARST REGION, 1982, 19 pages. This publication considers karst landscapes--in general, areas where fractured limestone or dolomite bedrock lies close to the surface and where pollutants can rapidly enter groundwater. Although developed in Minnesota, this publication contains information relevant to many areas of Wisconsin. Describes the special problems of areas with limestone and dolomite aquifers; describes agricultural practices to reduce pollution potential.

Bulletin Room, 3 Coffey Hall, 1420 Eckles Ave., U of Minnesota, St. Paul, MN 55108, Extension Bulletin 465, 30 cents

LAND USE AND GROUNDWATER QUALITY IN CENTRAL WISCONSIN'S SAND AND GRAVEL AQUIFER. A discussion of central Wisconsin groundwater, geology and movement, pollution potential, contaminant sources, local actions needed to prevent problems.

Draft, expect publicaton spring, 1985. For publication status contact Environmental Resources Center, 216 Agriculture Hall, 1450 Linden Drive, Madison, WI 53706 (608/262-0020)

GROUNDWATER IN WISCONSIN'S CREVICED BEDROCK REGIONS fall, 1985, 8 pages. An explanation of factors which effect groundwater quality in areas of Wisconsin where fractured limestone or dolomite bedrock is close to the soil surface. General information is presented on how specific land uses can cause groundwater contamination and what can be done about it. Sources of more specific information are identified.

Draft, expect publication fall, 1985. For publication status contact Environmental Resources Center, 106 Agriculture Hall, 1450 Linden Drive, Madison, WI 53607 (608/262-0020)

REGULATORY APPROACHES FOR ANIMAL WASTE MANAGEMENT ORDINANCES, 1984, 22 pages. Explains why ordinances should be considered as a way to protect surface and groundwater from contamination by livestock wastes. Provides model ordinances which can be used to accomplish protection objectives while making farmers eligible for cost sharing on livestock waste storage facilities.

County Extension Offices or Agricultural Bulletin Building, 1535 Observatory Dr., Madison 53706 (608/262-3346) Order No. G3269 50 cents

GROUNDWATER CONTAMINANTS AND HEALTH CONCERNS

ALDICARB AND WISCONSIN'S GROUNDWATER, 1983, 8 pages. A detailed discussion of what is known and not known about the pesticide aldicarb and groundwater: what aldicarb is used for and how it works, how it gets into groundwater, levels found in Wisconsin wells, the health threat to humans and animals, what happens to aldicarb in groundwater, alternatives to aldicarb.

County Extension Offices or Agricultural Bulletin Bldg., 1535 Observatory Drive, Madison, WI 53706 (608/262-3346) Order No. G3218 25 cents

PESTICIDES IN GROUNDWATER: HOW THEY GET THERE, WHAT HAPPENS TO THEM, HOW TO KEEP THEM OUT, 1983, 4 pages. Describes the mechanism of pesticide contamination of groundwater, what happens to pesticides after they are in groundwater, how to minimize contamination. Discusses the effect of the soil, the amount and timing of watering and the chemical nature of different pesticides on the potential for groundwater contamination.

County Extension offices or Agricultural Bulletin Bldg., 1535 Observatory Drive, Madison, WI 53706 (608-262-3346) Order No. G3213 20 cents

NITRATE IN WISCONSIN'S GROUNDWATER: SOURCES AND CONCERNS, 1980, 8 pages. Detailed description of the nitrogen cycle in agriculture, health and environmental impacts of nitrate, sources of nitrate to groundwater, and management practices to control nitrate leaching from croplands	County Extension offices or Agricultural Bulletin Bldg., 1535 Observatory Drive, Madison, WI 53706 (608/262-3346) Order No. A3054 15 cents
NITRATE IN DRINKING WATER, 1983, 2 page brochure. A general discussion of nitrate in diet and drinking water, sources of high nitrate health concerns, and precautions for using water with unacceptable nitrate levels. Includes sources of additional information and water testing information.	Wisconsin Department of Natural Resources, Box 7921, Madison, WI 53707
DRINKING WATER CONTAMINATION: UNDERSTANDING THE RISKS. Discusses the potential risk for groundwater contamination in different areas and the potential health risks. Discusses different types of contaminants and related health concerns. Describes how federal and state agencies judge health risks and establish drinking water standards. Discusses the need to balance risks with benefits. Describes how to minimize risks.	Draft: expect publication spring, 1985. For status contact Environmental Resources Center, 216 Agriculture Hall, 1450 Linden Drive, Madison, WI 53706 (608/262-0020)

WELLS AND DRINKING WATER

YOU AND YOUR WELL, 4 pages. Information for persons building a new home or replacing an existing water supply. Describes the basic requirements of Wisconsin's Well Code: when DNR approval is required, who can install wells and pumps, responsibilities of well drillers and pump installers to the homeowner, general well construction and location requirements, examples of different types of well and pump installations.	Wisconsin Department of Natural Resources District Offices or Box 7921, Madison, WI 53707
HOME TREATMENT ALTERNATIVES FOR CONTAMINATED WELLS. Describes the advantages and disadvantages of devices for treating contaminated private water supplies: carbon filters, distillation, ion exchange, reverse osmosis, chlorination. Discusses the desirability of ensuring a safe supply rather than simple treating contamination.	Draft in final editing; expect publication summer, 1985. For copies and publication status, contact Environmental Resources Center, 216 Ag. Hall, 1450 Linden Drive, Madison, WI 53706 (608/262-0020)

AUDIO-VISUAL MATERIALS

WISCONSIN'S GROUNDWATER--WISCONSIN'S FUTURE, 1983, slide/tape program. An introduction to Wisconsin's groundwater: where it comes from, its movement, potential sources of contamination and and resulting problems. Designed to compliment the publication Groundwater: Wisconsin's Buried Treasure.	Wisconsin Dept. of Natural Resources, Box 7921, Madison, WI 53707 and DNR District offices and Wisconsin Geological and Natural History Survey, 1815 University Ave. Madison, WI 53706, $10 rental; $35 purchase (from Geological & Natural History Survey)

WISCONSIN'S GROUNDWATER, 1984, a 16mm motion picture. An overview of groundwater in Wisconsin; the nature of the resource, problems and management needs (26 minutes, color).	Rental available at Bureau of Audiovisual Instruction, 1327 University Ave., Madison, WI 53706 (608/262-1644)
GROUNDWATER AND LAND USE IN THE WATER CYCLE - Posters 24" x 36" or 11" x 17". A colored pictoral illustration of land use activities and a cross-section of soil and geologic conditions. The poster effectively illustrates the relationship of land use activities to the quality and quantity of groundwater. It also shows how groundwater is linked to the hydrologic cycle. The 11" x 17" poster has explanatory information on the back. This information is not on the 24" x 36" poster.	Bureau of Water Resources Management, Department of Natural Resources, Box 7921, Madison, WI 53707 or Wisconsin Geological and Natural History Survey, 1815 University Ave. Madison, WI 53706
GROUNDWATER/LAND USE - Folding board display designed for use at fairs or other major public events. The display illustrates the basic relationship of land use to groundwater quality. It creates the awareness that most groundwater comes from local recharge, not from underground lakes or streams.	Pete Willoughby, Rm. B5A Agricultural Journalism, Madison, WI 53706, (608/262-0966)
Groundwater Flow Demonstration Model, 1983 Two dimensional demonstration models constructed with sand, sandwiched between plexiglass. The effect of clay barriers and well withdrawals on groundwater movement from recharge areas to discharge areas are to discharge areas are effectively demonstrated. These models can also be used to demonstrate concepts related to pollution in groundwater. Portable models are available on a loan basis. Larger models are available for use at major public events.	Environmental Resources Center, 216 Ag. Hall, Madison, WI 53706 or Wisconsin Geological and Natural History Survey, 1815 University Avenue, Madison, WI 53706 ATTN: Ron Hennings

ADDITIONAL PUBLICATIONS RELATED TO GROUNDWATER CONCERNS

IRRIGATION SCHEDULING. Factors to consider when determining amount and frequency of irrigation. Discusses environmental effects and economic benefits. Identifies additional sources of information.	Draft: publication date uncertain. WISP computer program complete. Published 1985.
APPLYING FERTILIZERS AND PESTICIDES THROUGH IRRIGATION. An explanation of laws, procedures, advantages and disadvantages of applying agricultural chemicals through irrigation.	Draft: publication date uncertain. Published 1985
HAZARDOUS WASTE LAWS: A GUIDE FOR COMMERCIAL PESTICIDE APPLICATORS. Reviews existing laws and their relevance to applicators; identifies additional sources of information.	County Extension Offices, or Agricultural Bulletin Bldg., 1535 Observatory Dr., Madison, WI 53706 (608/262-3346) Order No. A3170 15 cents

HAZARDOUS WASTE: DON'T KEEP IT DOWN ON THE FARM. Reviews procedures for handling and disposing of pesticide containers, rinse water and left over pesticides.	County Extension Offices or Agricultural Bulletin Bldg., 1535 Observatory Dr., Madison, WI 53706 (608/262-3346) Order No. A3185
EARTH STORAGE BASINS FOR LIQUID MANURE. Provides information on types of earth storage basins, and factors to consider when selecting, siting, designing, installing, and using the storage basin.	County Extension Offices or Agricultural Bulletin Bldg., 1535 Observatory Dr., Madison, WI 53706 (608/262-3346) Order No. A2795
GUIDELINES FOR LAND APPLICATION OF LIVESTOCK WASTES. Specific guidelines to help farmers develop manure management plans for capitalizing on the benefits of manure while avoiding environmental problems.	Draft: expect publication fall, 1985. For publication status, contact Environmental Resources Center, 216 Ag. Hall, 1450 Linden Drive, Madison, WI 53706 (608/262-0020)
TOXIC SUBSTANCE QUICK REFERENCE GUIDE, 1980, 2 page brochure. Provides information on who to contact about toxic substance problems: poisonings, misuse, spills, workplace exposure, etc.	Some information outdated and needs to be revised. For copies contact Environmental Resources Center 216 Ag. Hall, 1450 Linden Dr., Madison, WI 53706 (608/262-0020)
CHEMICAL HAZARDS IN THE HOME: SOLVENTS CHEMICAL HAZARDS IN THE HOME: PESTICIDES CHEMICAL HAZARDS IN THE HOME: HOUSEHOLD CLEANERS AND POLISHES, 1979, 10 pages each. Three separate publications identifying the dangers, health and environmental problems of common household products.	County Extension Offices or Agricultural Bulletin Bldg., 1535 Observatory Drive, Madison, WI 53706 (608/262-3346) 25 cents
DEVELOPMENTS IN SOLID WASTE MANAGEMENT. A continuing series of fact sheets that summarize local and national developments in solid waste: legislation, technical developments, publications, meetings, solid waste problems and solutions.	Available from Community Dynamics Institute, 610 Langdon Street, Madison, Madison, WI 53703 (608/262-9960)