Groundwater Management Plan

Adopted by the Portage County Board of Supervisors March 16, 2004

Portage County Groundwater Management Plan
2004

Portage County Planning and Zoning Committee

James Zdroik, Chair

Ronald Borski, Member
Robert Brilowski, Member
Leif Erickson, Member
Harvey Olson, Member

Prepared with the assistance of:

Groundwater Citizens Advisory Committee

Elizabeth Langer, Chair	Town of New Hope
Burt Benjamin	Town of Amherst
Mark Klein	Town of Belmont
David Shantz	Town of Buena Vista
Fred Copes	Town of Carson
Merle Weege	Town of Dewey
Craig Corbett	Town of Grant
Tim Zimmerman	Town of Hull
Nancy Turyk	Town of Lanark
Darrell DeGroff	Town of Pine Grove
Roy Woboril	Town of Sharon
Richard Filtz	Town of Stockton
Mike Hinrichs	Village of Amherst
Peter Mallek	Village of Junction City
Sarah Medow	Village of Nelsonville
Christine Neidlein	Village of Park Ridge
Chuck Bossingham	Village of Plover
Kim Hoppenrath	Village of Whiting
Andrew Peterson	City of Stevens Point

Prepared by:

Portage County Planning and Zoning Department

Primary Author: Raymond C. Schmidt, Water Quality Specialist
Project Director: Charles P. Kell, Director

Adopted

Portage County Planning and Zoning Committee	February 25, 2004
Portage County Board of Supervisors	March 16, 2004

TABLE OF CONTENTS

		Page
SECTION 1.0	INTRODUCTION	1
1.1	Background and Institutional Framework	1
1.2	Goals and Objectives	2
1.3	Authority	3
1.4	Cooperating Agencies	4
SECTION 2.0	ENVIRONMENTAL ASSESSMENT	5
2.1	Availability of Data	5
2.2	Pollution Attenuation in the Physical Environment	5
2.3	Evaluation of Groundwater Vulnerability to Pollution	12
2.4	Summary of Environmental Setting	22
SECTION 3.0	LAND USE AND POTENTIAL POLLUTION SOURCES	24
3.1	Introduction	24
3.2	Land Use and Population Summary	25
3.3	Manure Storage Structures	27
3.4	Petroleum Product Pipelines	27
3.5	Biosolids Landspreading	30
3.6	Spray Irrigation of Wastewater	33
3.7	Unused or Unsafe Wells	33
3.8	Petroleum Product Storage Tanks	33
3.9	Private Onsite Wastewater Treatment Systems	34
3.10	Landfills	37
3.11	Storage and Use of Road Salt	37
3.12	Municipal Sewer Systems	37
3.13	Septage	37
3.14	Agricultural Chemicals ï Nitrate Nitrogen	40
3.15	Agricultural Chemicals ï Pesticides	40
3.16	**Lawn and Garden Chemicals**	**41**
SECTION 4.0	THE COUNTY'S GROUNDWATER RESOURCES	43
4.1	Introduction	43
4.2	Groundwater Quantity	43
4.3	Groundwater Quality	51
SECTION 5.0	MANAGEMENT TECHNIQUES AND OPTIONS	61
5.1	Existing State Regulatory and Educational Framework	61
5.2	Existing Local Groundwater Management Framework	78
SECTION 6.0	RECOMMENDATIONS	83
6.1	Goals	83
6.2	Strategies	84
APPENDIX SR	Soil Ranking System	91
APPENDIX PS	Private Onsite Wastewater Treatment Systems	92
APPENDIX VG	Portage County Value of Groundwater Survey	101
APPENDIX RE	Status of Implementation of 1988 Plan Recommendations	104
APPENDIX CE	Conservation Easements	105
APPENDIX AD	Agricultural Diversification	107
APPENDIX WA	Well Abandonment Sample Ordinance	112
APPENDIX HC	High Capacity Well Resolution	118
APPENDIX PH	Public Health Groundwater Quality Standards	120

APPENDIX PI Minutes from Public Hearing, Correspondence and Comments 124

LIST OF FIGURES

		Page
Figure 2.1	Surficial Geology	7
Figure 2.2	General Soil Associations	8
Figure 2.3	Groundwater Depth	11
Figure 2.4	Particle Tracking Contaminant Source Analysis	13
Figure 2.5	Groundwater Elevation	20
Figure 2.6	Municipal Well Recharge Areas	21
Figure 3.1	Manure Storage	28
Figure 3.2	Petroleum and Natural Gas Pipelines	29
Figure 3.3	Biosolids (Sludge and Septage) Landspreading	31
Figure 3.4	Well Abandonment	32
Figure 3.5	Likely Failing Private Onsite Wastewater Treatment Systems	35
Figure 3.6	Suitable Soils under COM-83	36
Figure 3.7	Landfills	38
Figure 3.8	Municipal Sewer Service Area	39
Figure 4.1	Lake Emily Monitoring Well Hydrograph	44
Figure 4.2	Plover Monitoring Well Hydrograph	45
Figure 4.3	Bancroft Monitoring Well Hydrograph	46
Figure 4.4	TriCounty Monitoring Well Hydrograph	47
Figure 4.5	Naturally Occurring Radioactivity in Bedrock Wells	52
Figure 4.6	Known Areas of Naturally Corrosive Water	54
Figure 4.7	Pesticides (Other Than Atrazine) Detected in Private Wells	56
Figure 4.8	Atrazine Detected in Private Wells	57
Figure 4.9	Nitrate Nitrogen in Private Wells	59
Figure 4.10	Nitrate Nitrogen Trend in Whiting Municipal Well	60
Figure 6.1	Known Well Construction	86

SECTION 1.0 INTRODUCTION

This report represents the combined efforts of many individuals concerned with the wise management of Portage County groundwater resources. The discussions, analyses, and inventories are based on the best available information at this time, and provide a strong foundation for continuing a responsive and effective groundwater management program for Portage County. As with all programs of this type, conclusions, recommendations, and plans of action will need to be updated in future years as our database expands and our knowledge of **groundwater resources and management techniques grows**. **A five year revision cycle has been recommended as appropriate.**

This report is the 2004 Revision to the Portage County Groundwater Management Plan adopted in 1988, and contains the background information for developing management strategies, as well as specific goals and strategies for planning, management, and education.

This report contains the following subjects:

Section 1..... Introduction
Section 2..... Environmental Assessment
Section 3..... Inventory of Pollution Sources
Section 4..... County Groundwater Resources
Section 5..... Management Techniques and Options
Section 6..... Recommendations

.

SECTION 1.1 BACKGROUND AND INSTITUTIONAL FRAMEWORK

Portage County, population 67,182 (2000 US Census), is located in central Wisconsin, adjacent to the Wisconsin River. The County consists of 17 civil townships covering 823 square miles or 526,000 acres. The Stevens Point - Plover - Whiting urban area is situated within 40 miles of Wausau, Marshfield, and Wisconsin Rapids. Portage County is bordered on the north by Marathon County, on the south by Adams and Waushara Counties, on the east by Waupaca County, and on the west by Wood County.

The landforms and hydrogeology of Portage County are strongly linked to past glacial activity. Distinct land types are apparent across the County, presenting an interesting variety of geology, soils, land use potentials and limitations, and other characteristics related to groundwater management.

Our groundwater resources are vital to the health and prosperity of Portage County. One hundred percent of domestic water use and greater than ninety percent of all water use in the County is from groundwater resources. Groundwater contamination problems, such as numerous instances of nitrate nitrogen exceeding the public health standard, and the detection of pesticides in groundwater, have called attention to the need for groundwater management strategies to protect this invaluable resource. Maintaining the quality and quantity of groundwater is vital to the maintenance of the quality of life in Portage County and the health of its residents (See APPENDIX VGï Value of Groundwater Survey**).** If the groundwater resources are allowed to continue to deteriorate, not only human health and environmental quality will be affected, but economic growth, property values, and the image of the County will also suffer.

In September 1984, the Portage County Board of Supervisors created a Groundwater Council, charged with the primary task of developing a strategy and policy for addressing public concerns on groundwater protection and management for recommendation to the County Board. The Council was composed of local public officials representing various units of government from throughout the County.

To assist in the identification of public concerns and the resolution of problems, the Council created the Technical and the Citizens Advisory Committees. The Technical Advisory Committee was composed of representatives from County and State departments whose activities related to groundwater protection and management.

The primary functions of the Technical Advisory Committee were to gather and evaluate technical data, recommend alternative courses of action, and to implement the directives of the Council.

The Citizens Advisory Committee was composed of citizens representing various interests from throughout Portage County. The functions of the Citizens Advisory Committee were to identify the concerns of the County's residents, recommend educational programming, and to review the information and recommendations made by the Technical Committee.

Based on input from the County Board and the Technical and Citizens Advisory Committees, the Groundwater Council established the following priority list for groundwater activities:

1. Protection of public well recharge areas;
2. Development of a comprehensive groundwater protection plan;
3. Aldicarb use;
4. Greater emphasis on information and education;
5. Fertilizer use in agriculture;
6. Nitrate sources and contamination;
7. Coordination and computerization of available groundwater quality data;
8. Hazardous waste generation and disposal;
9. Pesticide use; and
10. Private well permitting and construction.

In reviewing the County's management priorities, it was decided that the development of a Countywide Groundwater Management Plan should be the County's number one priority because the management plan would address and include recommendations concerning most of the other individual items identified as important in the Council's survey. The County Board subsequently passed a resolution in December 1985 directing the Portage County Planning Department to prepare a Countywide Groundwater Management Plan in cooperation with other County departments.

Following adoption of the Groundwater Management Plan in 1988, several changes were made in the structures of county agencies and committees to facilitate implementation of the recommendations of the Plan. Responsibility for all County groundwater related programs was assigned to the Planning and Zoning Committee. The Planning Department, the Zoning Department, the Land Conservation Department, and the groundwater related functions of the Community Human Services Department were consolidated into the newly formed Planning and Zoning Department. The County hired a permanent Water Quality Specialist. The Technical Advisory Committee was disbanded.

The CitizensôAdvisory Committee (CAC) was reformulated to allow each of the incorporated and unincorporated municipalities in the County to appoint a representative to the CAC. The task of the CAC was to advise the Planning and Zoning Committee on ways to implement the recommendations of the Plan. A reorganization of the CAC in 1995 added three Subcommittees ï Groundwater Management and Implementation, Public Involvement and Education, and Continual Assessment ï to play specific roles within the overall groundwater management structure.

Most of the recommendations of the 1988 Plan have been implemented, with available funding and expertise, based on the priorities assigned to each task. The summary of recommendations, and the status of each, is included in Appendix RE.

SECTION 1.2 GOALS AND OBJECTIVES

The goals of this planning effort are the same as for the development of the original Portage County Groundwater Management Plan - to identify the major problems facing our County with respect to our groundwater resources, to provide specific action recommendations for groundwater protection and management in the County, and to provide a technical basis and justification for these recommendations based on the best available information.

Since a great deal of knowledge has been gained since adoption of the 1988 Plan, certain sections of this plan revision are more extensive than others. Some of the issues identified in the 1988 Plan have been dealt with institutionally, and groundwater protection relative to these issues is ongoing. The additional knowledge gained over the intervening years will be used to identify and address groundwater problems not identified or adequately addressed under the earlier Plan. The recommendations for actions contained in this Plan are based on the potential of groundwater contaminants to harm the health of Portage County residents and to cause deterioration of the natural environment.

The primary objectives were to accomplish the following:

1. Develop, from appropriate databases, information describing how meteorology, topography, soils, land use practices, and waste management practices may influence the quality and quantity of Portage County's groundwater resources.

2. Inventory existing and potential sources of groundwater pollution in Portage County, assess the risks these pollution sources present to groundwater quality and the health of our citizens, and present available regulatory and nonregulatory (management) practices to control and prevent these sources of pollution from causing unacceptable levels of groundwater contamination.

3. Delineate, map, and compile information on areas in Portage County most susceptible to groundwater pollution. All information will be compatible with the Countywide geographic information system (GIS), to allow flexible analysis of potential solutions to current or anticipated groundwater contamination.

4. List available Federal, State, and local options and approaches to groundwater management and protection.

5. Identify potential corrective actions, technologies and alternatives to apply in areas already experiencing groundwater contamination.

6. Develop management and regulatory alternatives and recommendations (action program) for implementing groundwater management and protection programs at the County level.

7. Establish, where appropriate, various County departmental policies necessary to implement effective groundwater management.

8. Continue to develop a cooperative network with County municipalities, whereby these municipalities develop appropriate groundwater management strategies for areas outside of County jurisdiction.

SECTION 1.3 AUTHORITY

County planning and zoning authority is set forth in s.59.69 of the Wisconsin Statutes. The County board of any county may plan for the physical development and zoning of territory within the county for a number of purposes listed in s.59.69(1), including:

> "...to encourage uses of land and other natural resources which are in accordance with their character and adaptability;...to encourage the protection of groundwater resources;é to preserve wetlands...to conserve soil, water and forest resources;...to provide healthy surroundings for family life..."

Reference to preparation of a county development plan are contained in s.59.97(3). More specifically, s.59.69(3) provides:

> "The county zoning agency may direct the preparation of a county development plan or parts of the plan thereof for the physical development of the unincorporated territory within the county..."

Furthermore, zoning and other land use decisions should be based on the development plan as per s.59.69(3)(f):

> "...The development plan shall serve as a guide for public and private actions and decisions to assure the development of public and private property in appropriate relationships."

Wisconsin's comprehensive groundwater legislation, 1983 Wisconsin Act 410, specifically added groundwater protection to the statutory authorization for planning and zoning to protect the public health, safety, and welfare. This legislation, which became effective on May 11, 1984, clearly established groundwater protection as a high priority in Wisconsin. In addition to encouraging local planning and zoning for groundwater protection, this law also established State level programs to set groundwater quality standards, provide compensation for chemically contaminated private wells, regulate groundwater monitoring, develop laboratory certification, provide an environmental repair fund for problem waste disposal sites, and several other new regulatory programs.

SECTION 1.4 COOPERATING AGENCIES

Successful completion of this plan revision required assistance from staff of County, State and Federal agencies, including Portage County Planning and Zoning and Health and Human Services Departments, Department of Natural Resources (DNR), Department of Agriculture, Trade, and Consumer Protection (DATCP), Department of Commerce (COM), University of Wisconsin, University of Wisconsin-Extension, Wisconsin Geological and Natural History Survey (WGNHS), Central Wisconsin Groundwater Center, Natural Resources Conservation Service (NRCS), and Golden Sands Resource Conservation and Development (RC&D), and United States Geological Survey (USGS).

Much of the information on the hydrogeologic setting in Portage County, the potential contaminant sources, the groundwater quality, and known well construction has been incorporated into the County computerized geographical information system (GIS). The GIS system technology will help resource managers and scientists to analyze the relationships between groundwater quality, groundwater flow, land use (potential pollution sources), soils, and subsurface materials so that management strategies can be refined to be most effective. The essential GIS layers, including Soil Survey (NRCS) and Wetland (DNR) maps, Groundwater Contours and Aquifer Potential (WGNHS) maps, hydrology, and tax parcels have been completed, and will continue to be updated. Well construction and water sample information for individual wells has been compiled from several databases maintained by DNR, DATCP, UW Stevens Point and Portage County, and will be updated as time allows. Private sewage system information has been entered from paper files in Planning and Zoning. Other additional information will continue to be incorporated into the GIS to allow program planning and analysis to be performed using current data. It is anticipated that this Plan and other GIS based information will be available to the public over the Internet in the future.

SECTION 2.0 ENVIRONMENTAL ASSESSMENT

A thorough assessment of the physical environment of Portage County is required in order to understand the existing pattern of groundwater quality and the potential degradation of groundwater quality from a variety of activities and land uses, and to address the groundwater concerns critical to the residents of the County. The environmental assessment is the foundation for designing and implementing effective groundwater management strategies.

SECTION 2.1 AVAILABILITY OF DATA

The environmental assessment that follows is based on existing data. There is considerable general information available for Portage County's soils, surficial geology, bedrock geology, and groundwater hydrology and hydraulics. The environmental assessment is adequate for developing County management options. However, analysis of specific development proposals or possible problem areas will require additional site specific data acquisition. In addition to providing a basis for management of County groundwater resources, this document should also alert County planners, private developers, and landowners to potential problems, and help identify and direct further study needs. This assessment should be revised and updated as additional data is acquired.

SECTION 2.2 POLLUTION ATTENUATION IN THE PHYSICAL ENVIRONMENT

The pollution attenuation potential of a given site is the inherent ability of the site to remove, immobilize, or modify pollutants to reduce adverse impacts on groundwater quality. The primary environmental factors that must be considered in order to evaluate the pollution attenuation potential include:

The Soil Zone:
- depth
- texture (clay and silt content)
- permeability
- slope
- organic matter content
- pH

The Unsaturated Zone:
- thickness
- texture
- permeability

The Saturated Zone:
- texture
- permeability (hydraulic conductivity)
- net recharge
- direction of flow

Portage County is a complex mixture of these factors. Generally, the County can be divided into three areas on the basis of similar geologic and hydrologic conditions (Figure 2.1). The drift-crystalline rock province occupies the northwest portion of the County, the sand plain province is located in the central and southwestern portions of the County, and the drift province occupies the eastern portion of the County. An evaluation of environmental factors will necessarily follow this general division.

A. Soils

There are 38 identified soil series in Portage County grouped into 11 soil associations. Four associations are generally related to the sand plain province, two to the drift province, three to the drift-crystalline rock province, and two associations are related to alluvial or organic deposits (Figure 2.2).

Soils are generally considered to be the upper five feet (or less) of unconsolidated materials that support plant growth. The soil zone properties are the most important factors in determining the natural pollution attenuation capability in a given area. Pollutants can be removed or modified in the soil layer through physical processes such as filtration, chemical processes such as adsorption and precipitation, and biological processes such as plant uptake, denitrification, and decomposition. The soil layer, especially the top 18 inches, is generally the most chemically and biologically active zone between surficial pollutant sources and the aquifer, and is therefore considered the first line of defense. The roles of individual soil zone factors are summarized below.

1. Soil Texture - The distribution of soil particle sizes influences the rate of water movement through the soil and the active surface area of the soil. Fine textured soils have greater surface area and lower permeability and, therefore, longer contact time and greater sorption area for pollution attenuation. High clay content can be especially advantageous for pollution attenuation because of very small pore size and tremendous surface area available for sorption of cations (positively charged molecules). Some pesticides are inactivated and degraded by sorption to clay colloids. Factors that can alter the effective texture, such as macropore phenomena, should also be considered. This would be most noticeable in otherwise fine textured soils, such as shrinking clay.

2. Soil Permeability - Defined as the rate of water movement through the soil, this factor is extremely important to the attenuation potential. As noted in the discussion of soil texture, a slow rate of water movement increases the contact time between waterborne pollutants and the soil particles and, therefore, allows the natural contaminant-removal processes to function more effectively.

3. Soil Depth - Influences the amount and time of contact between the pollutants and the soil particles. Deeper soils increase the contact and potential attenuation from inherent physical, chemical, and biological treatment processes.

4. Soil pH - The acidity of the soil influences the solubility of pollutants and the rate of biological processes that may remove pollutants. In general, acid soils tend to increase pollutant solubility, reduce sorption onto soil particles, and reduce the effectiveness of biological treatment processes.

5. Soil Organic Matter - The amount of soil organic matter influences the sorption potential of the soil and the level of biological activity. Organic matter can bind volatile organic chemicals, metals, nutrients, pesticides, and some pathogens. Organic matter also serves as an energy source for microorganisms essential in the breakdown of organic wastes and pesticides. Wet organic soils may also remove nitrogen through denitrification. Wet organic soils often occur in groundwater discharge areas where pollutants are more of a surface water quality problem.

6. Soil Slope - Can influence the amount of water that will infiltrate into a soil. Flat slopes tend to increase the infiltration of water and associated contaminants into the soil and, therefore, the potential local recharge to (and pollution of) the aquifer. Steeper slopes lead to transport of runoff water and associated contaminants to another location downslope where it either recharges the groundwater or contaminates surface waters.

B. Surficial Geology

Below the soil zone and above the bedrock are unconsolidated deposits. These may be weathered residuum from bedrock, glacial materials, or alluvial deposits of a more recent origin. For the most part, the unsaturated zone between the near surface (A and B) soil horizons and the saturated zone consists of these materials, although crystalline bedrock occurs near the surface in the northwestern portion of the

County, and sandstone mounds are found in several areas. The deep and widespread glacial deposits of the sand plain and drift provinces are also the major water supply aquifer for the area and, therefore, the saturated zone is also generally characterized by these materials. Even in the drift-crystalline rock province, most wells are shallow wells tapping water in the thin glacial drift or water collected in shallow fractured and weathered crystalline rock zones. Portage County does not rely on deep sedimentary rock aquifers for groundwater as do many areas in southern Wisconsin and the rest of the United States.

Surficial Geology

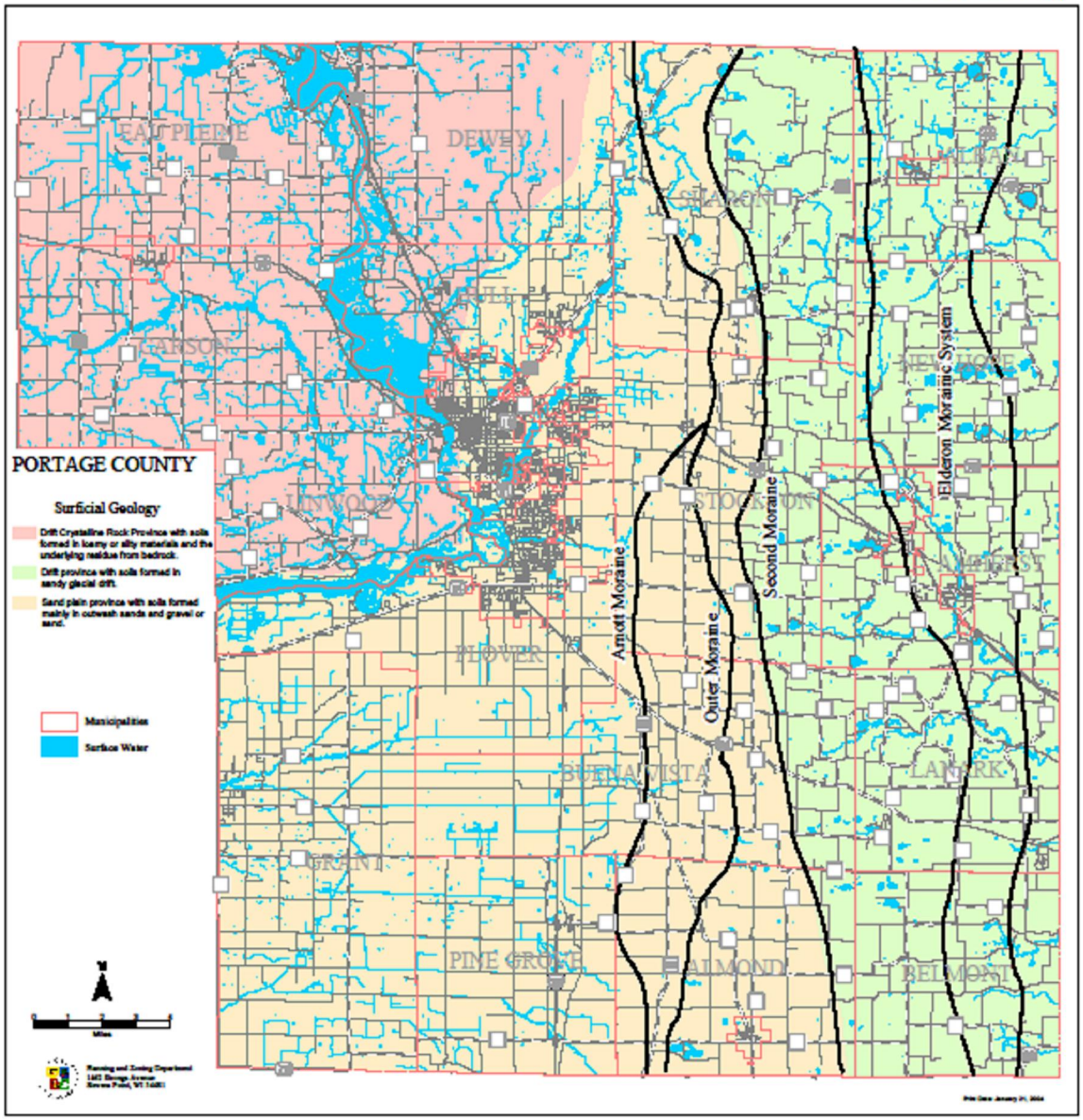


Figure 2.1

General Soil Associations

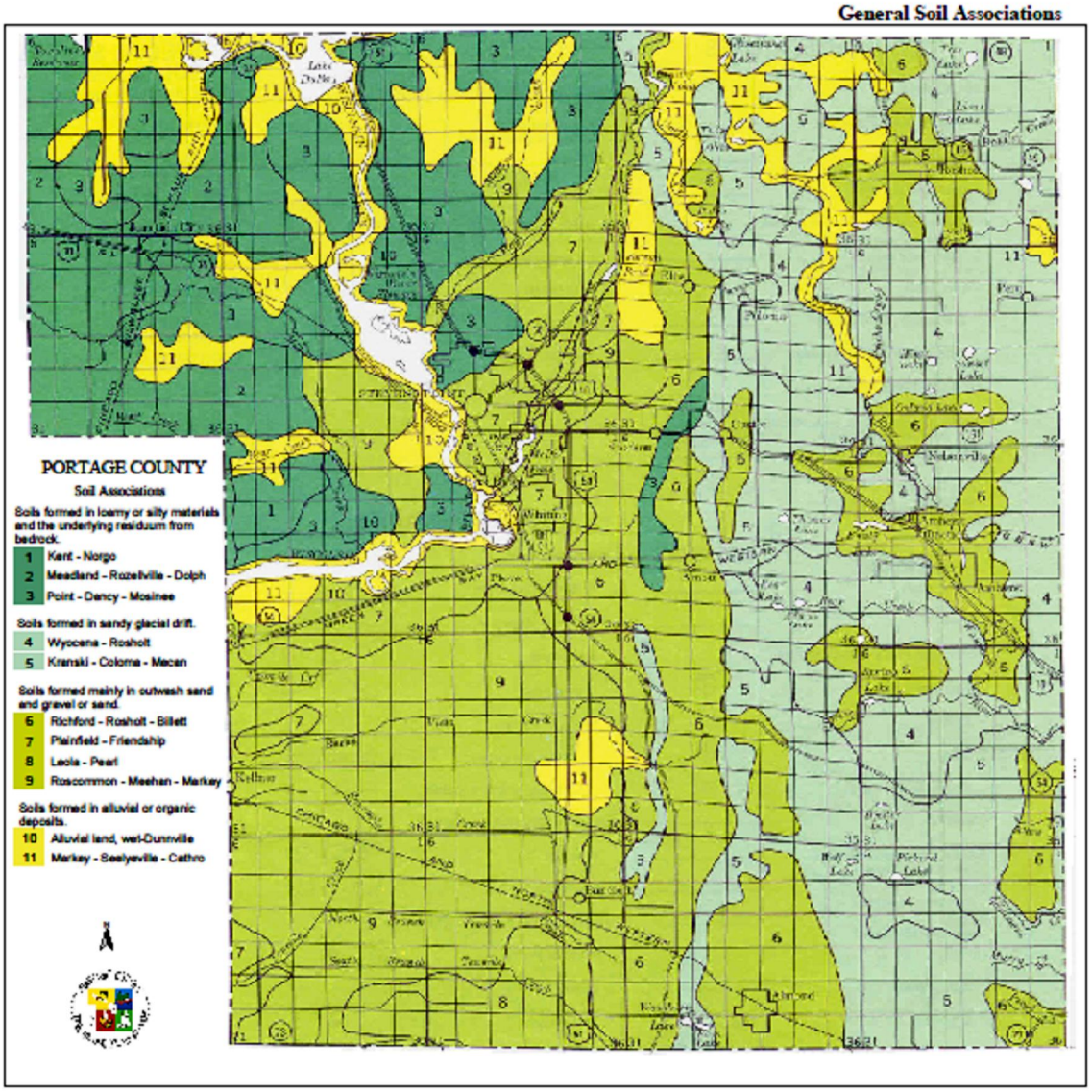


Figure 2.2

The unsaturated zone below the A and B soil horizons generally has less pollution attenuation potential than the upper soil zone, and is considered a secondary line of defense. This zone is below the active rooting zone of most plants and there is less organic matter and biological activity. Chemical and physical processes such as sorption can still slow downward movement of some pollutants, and thick unsaturated zones can significantly delay the transport of some contaminants to the water table. Thickness, textures (including occurrence of sand lenses, and silt and clay beds), and permeability of materials in this unsaturated zone are parameters of considerable importance in groundwater protection.

In the saturated zone, biological processes are also less important than physical-chemical sorption processes. Texture and permeability of aquifer materials are obviously important parameters. The rate of water movement is also related to the overall groundwater flow systems. The amount of head, or difference in water table elevations between recharge and discharge areas, is the driving force and can be quite variable over short distances. Local impacts, such as pumping high capacity wells, can create a significant cone of depression, which can greatly increase the slope of the water table and change the rate and direction of groundwater movement.

Obviously, the glacial deposits characterizing the unsaturated and saturated zones of much of the County are of primary importance to this environmental assessment. In much of the County, the pollution attenuation potential is dependent on soils formed in glacial materials, and on subsurface materials of glacial origin. It is important to understand glacial processes and the resulting characteristics of the materials transported and deposited by the glaciers.

The present Portage County landscape primarily reflects the last or Wisconsin stage of the Pleistocene or glacial epoch. The glacial ice transported large amounts of rock debris known as drift. The drift is called till, if deposited directly by the ice, and outwash, if placed by glacial meltwater.

The hilly drift province of eastern Portage County is a series of end moraines (Figure 2.1). These ridges and hills are composed of sandy till up to 350 feet thick and represent the accumulation of ice-transported debris that piled up at the forward edges of the ice sheets.

The Arnott moraine marks the western advance of an early glacier. It is generally an unsorted mixture of materials ranging in size from clay to boulders, with a large proportion of quartz sand. The outer, second, and Elderon moraines represent later advances of the ice sheet during the Wisconsin stage. These moraines are also a heterogeneous, unsorted mixture of materials with a predominant sand size fraction.

As the ice melted and the end moraines were formed, large amounts of ice-transported materials were removed by the melt waters. This glaciofluvial (outwash) material was deposited between the moraines and in a large area to the west. The deep sand and gravel deposits of the sand plain province were formed in this way. The sand and gravel is well sorted and contains only small amounts of silt and clay. Deeper gravel deposits are found adjacent to the end moraines. The sands are generally finer further from the moraine. The thickness of outwash deposits ranges from less than 30 feet northeast of Stevens Point to over 200 feet near the outer moraine, and averages about 100 feet.

The glacial presence is less noticeable in the drift-crystalline rock province in the northwestern portion of the County. Although this area is mapped as part of the driftless or unglaciated area of Wisconsin, there are thin, heterogeneous till and outwash deposits of clay, silt, sand, and gravel from an earlier glacial period. The average thickness is only four feet. The topography is controlled primarily by the shallow granitic bedrock, and soil properties reflect the underlying bedrock residuum and the loamy, silty nature of the unconsolidated materials.

Areas identified as alluvium (Figure 2.2) are post-glacial deposits of materials eroded from uplands and accumulated in lower areas such as marshes (organic-rich clay, silt, sand, and peat) and stream valleys (well-sorted silt, sand, and gravel). These alluvial deposits range from a few feet to over 60 feet in thickness.

C. Bedrock Geology

The basement bedrock underlying the County consists of impermeable crystalline rocks of Precambrian age, mainly granite. As noted previously, this granitic material is at or very near the surface in the northwestern portion of the County. To the east and south, glacial outwash and morainal deposits cover the crystalline bedrock. In the southern part of the County, the crystalline rocks are overlain with medium to coarse grained sandstone of late Cambrian age. The sandstone generally has uniform composition, but varies in the degree of cementation. The sandstone is estimated to be up to 200 feet thick along the southern edge of the County, thinning and eventually disappearing in the central part of the County, except for isolated remnant mounds such as just east of Plover and east and west of Stevens Point. Although the sandstone is a potential aquifer, almost all wells presently utilize the thick overlying glacial deposits. The sandstone aquifer may someday have greater importance and will need to be studied in greater detail. This report will deal primarily with the unconsolidated materials.

There are no areas of carbonate bedrock in Portage County.

The impermeability of the shallow crystalline bedrock in the northwestern portion of the County makes it impossible to obtain significant quantities of water from wells terminated in the bedrock. The Village of Junction City, and several thousand County residents obtain, their drinking water from bedrock wells.

D. Groundwater

The unconsolidated glacial deposits are the most important aquifer in the County. Wells in the sand and gravel aquifer of the sand plain province generally have a potential yield exceeding one thousand (1,000 gpm) gallons per minute, and wells in the sand and gravel aquifer of the drift province potentially yield over five hundred (500 gpm) gallons per minute. All municipal water supplies (except Junction City) are from wells terminating in sand and gravel aquifers. Wells terminating in bedrock can produce flows below one (1) gallon per minute.

An aquifer is a dynamic component of the hydrologic cycle. Water falling on the earth's surface can run off as surface water or can infiltrate into the soil. Water in excess of plant needs and the soil moisture holding capacity will continue to move downward to recharge the (groundwater) aquifer. Water reaching the saturated zone continues moving underground until reaching discharge areas such as springs or streams. During times when the soil is frozen, or during extended periods of minimal precipitation, stream base flow depends on discharges from groundwater. The amount of water recharging the aquifer is an important factor when considering waterborne pollutants. The average annual recharge to the groundwater in Portage County ranges from 2 inches in the drift-crystalline rock province to 10 inches in the sand plain province. Many variables influence the amount of infiltration and potential recharge and pollution of an aquifer at a given site, including slope of the land surface, permeability of the soils and unsaturated materials, distribution of precipitation, and land use practices.

The depth to the water table is quite variable across the County, ranging from often less than one (1) foot in the northwest to one hundred fifty (150) feet plus in the moraines of the drift province (Figure 2.3).

Aside from the parameters that directly relate to pollution attenuation and recharge potential, the groundwater flow system also needs to be considered in order to evaluate the potential impact of pollutants that reach the aquifer without significant attenuation.

Groundwater moves from topographic highs (recharge areas) to topographic lows (discharge areas). Vertically within an aquifer there may be different flow systems to consider. Local groundwater flow systems represent shallow saturated flow moving between recharge areas and adjacent discharge areas in relatively short time periods, such as months. Depending on the degree of undulation in the water table and the depth of the aquifer relative to its length, intermediate and regional flow systems may also develop below the local flow systems. In a regional flow system, water is recharged to a deep aquifer at

major divides and recharge areas, and is discharged many years later at major hydrologic discharge areas, such as rivers and lakes.

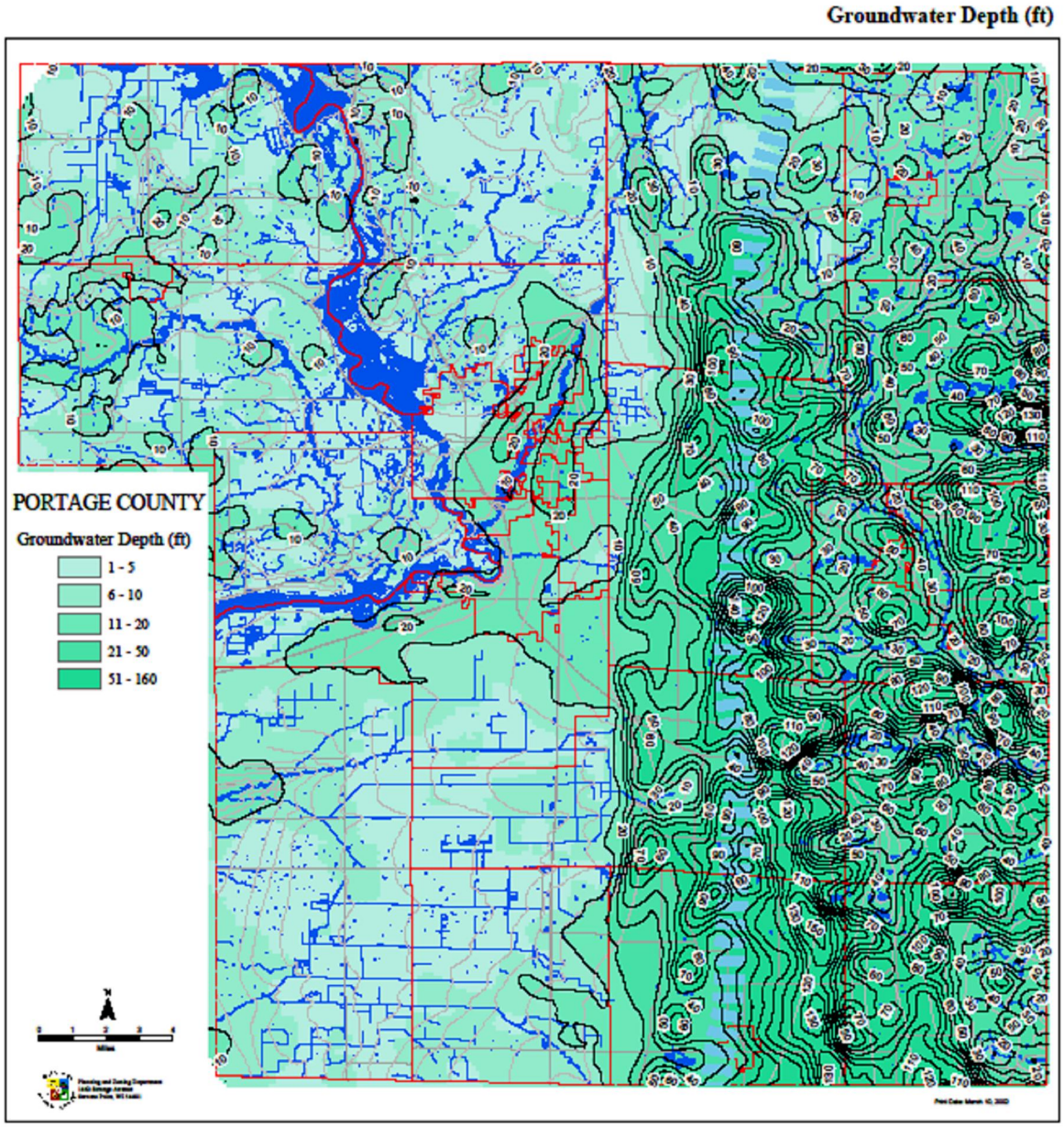


Figure 2.3

The concept of groundwater layering may also be applicable to flow within a given recharge/discharge flow system in fairly uniform aquifer materials. A vague layering of water and water quality will often develop as the water flows downgradient within the flow system because water is recharged to the flow system at various distances from the discharge point. Unless mixing occurs, recharge distant from the discharge point generally will be layered below recharge occurring closer to the discharge point. This layering feature has important implications in understanding the relationship between well depth, water quality, and land use patterns.

Due to the nature of glacial processes, even within the major (drift and sand plain) provinces, the materials were not uniformly deposited. Simple layering, though an easy concept to visualize, does not accurately depict the flow of groundwater and its contaminants from recharge zones to discharge zones. Within each flow system it is likely that water infiltrating further from the discharge area could reach the discharge area sooner than groundwater recharged closer to the discharge due to more rapid movement through coarser materials.

In the northwestern portion of the County, only local flow systems are likely to develop in the relatively thin and shallow sand and gravel materials overlying the crystalline bedrock. Groundwater flow that may occur in the crystalline bedrock, especially along larger fractures, represents deeper regional flow systems.

Within the drift province, the pronounced variations in topography induce extensive local flow systems that probably extend to considerable depths. Given the thickness of the morainal deposits, deeper intermediate or regional flow systems are also likely. Within the sand plain province, the very long flow paths relative to the thickness of the aquifer and the more uniform, linear nature of the water table suggest little opportunity for true regional flow systems to develop. Research has also shown that even drainage ditches in the sand plain area can seasonally intercept all groundwater flowing downgradient in the sand and gravel aquifer (Faustini, 1985). Generally, the Wisconsin River and major tributaries and ditches are the main discharge areas. Vertical mixing at high capacity wells common throughout the sand plain also obscures vertical aquifer distinctions.

Based on information such as aquifer thickness and anticipated pumping rates, it is possible to create a computer model of the recharge area for a well or well field (Kraft and Mechenich, 1996). Particle tracking analysis (Figure 2.4) can determine the geographic origin of contaminants likely to reach a given well, and the time required for pollutant travel. Perhaps more importantly from a municipal water supply perspective, it is possible to determine locations which do not contribute recharge to a particular well or well field. Without a detailed analysis of the flow systems in a given area, the assumption should be made that water and waterborne pollutants discharging at any particular site, such as a well field, could enter the aquifer system at any point upgradient to the regional groundwater divide.

SECTION 2.3 EVALUATION OF GROUNDWATER VULNERABILITY TO POLLUTION

A. Evaluation System

There are numerous qualitative and quantitative evaluation systems that might be used, depending on the objectives and the available resources. This report will discuss separately the three basic components: soil attenuation factors, subsurface attenuation factors, and groundwater flow factors.

B. Soils And Their Ability To Protect Groundwater

Section 2.2A described the role of individual soil zone factors relative to pollution attenuation and protection of groundwater quality. In the following section, these factors are considered for the soils of Portage County. This assessment of the pollution attenuation potential for Portage County soils is supported by numerical ranking procedures. To calculate the numerical rankings, the critical factors considered for each soil are given a relative value depending on their importance and relationship to

pollution attenuation potential. The values are then summed for each soil to obtain an overall ranking value. These relative values are for comparison only and have no absolute value.

Particle Tracking Contaminant Source Analysis

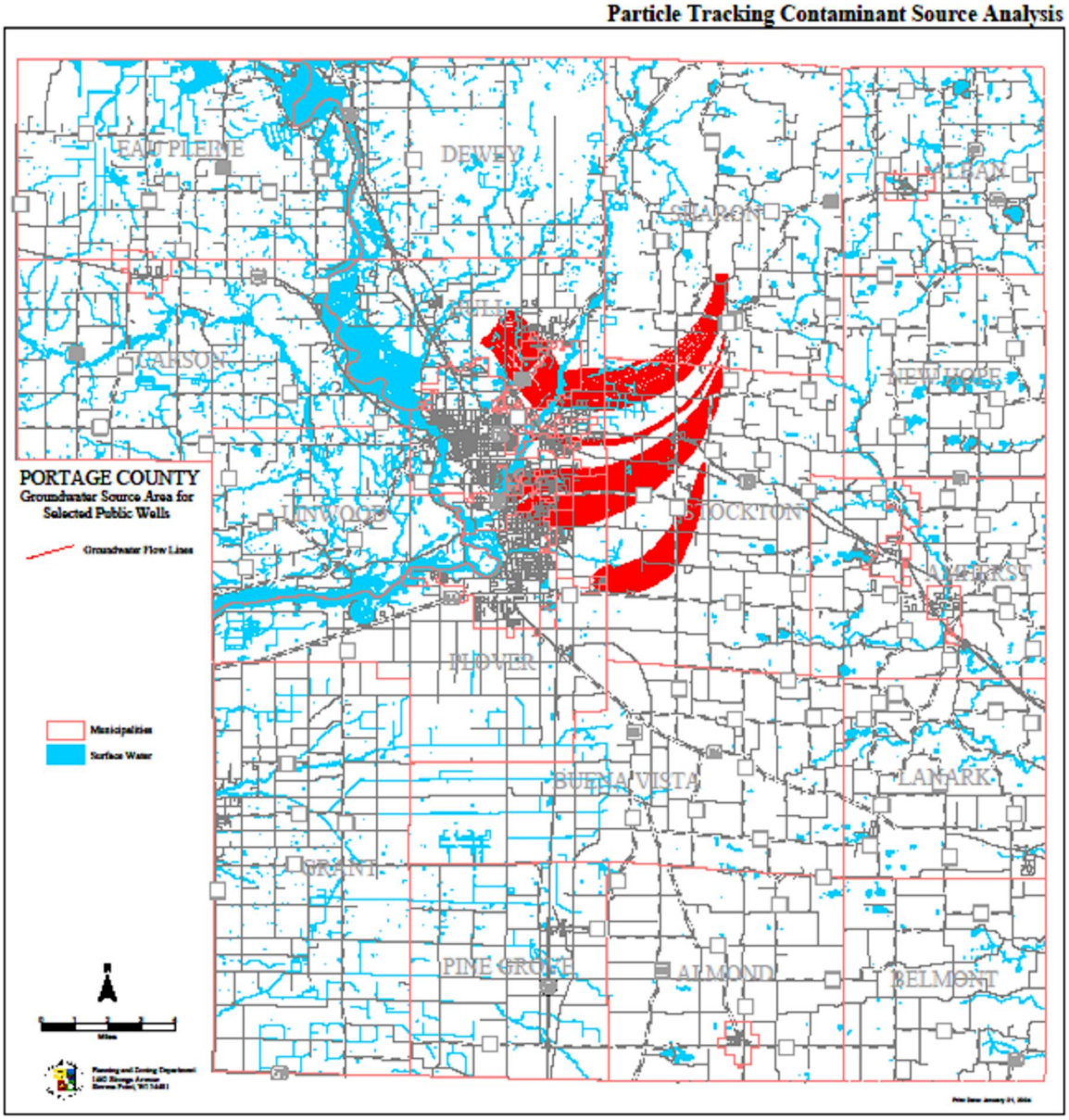


Figure 2.4

The ranking system used in the following discussion of the pollution attenuation potential of Portage County is based on a ranking system developed by the Wisconsin Geological and Natural History Survey (WGNHS).

The WGNHS ranking system heavily penalizes organic/wet soils because of a high water table and possible interruptions in the pollution attenuation processes. In specific situations, for certain contaminants, areas of organic/wet soils may provide favorable attenuation potential. To consider this possibility, the WGNHS system was modified slightly in this report to address soil organic matter. A slope factor was also added. Possible soil scores range from 10 to 63; the higher the value, the greater the pollution attenuation potential and the lower the risk of groundwater contamination.

The calculated scores for each soil series or soil mapping unit in Portage County are given in Table 2.1. The values range from 11 to 47. Values of 0 to 30 are considered to have the least potential to protect the groundwater, 31 to 40 marginal potential to protect the groundwater, 41 to 50 good potential, and 51+ best potential. No soil in Portage County scores over 50.

Soils in the group offering the least groundwater protection (0-30) generally include the coarse textured, highly permeable glacial outwash and sandy drift soils covering much of the County. Soils offering marginal groundwater protection (31-40) generally have finer texture and lower permeability and/or are well developed, deep soils. Some of the soils in the northwestern portion of the County and some organic soils fall into this category. Soils offering good groundwater protection (41-50) generally are deep, fine textured soils with low permeability or high organic matter content. Only two soils in the northwestern portion of the County, and two very deep organic soils, fall into this category. Individual soil characteristics used in the ranking procedure (Tables 2.2-2.5) and the spatial extent of each soil is available from the Portage County Soil Survey (USDA, 1978, revised 2001).

The 71 discrete soil mapping units that have been identified for Portage County make any discussion of soil attenuation ability difficult. The grouping of soil series into associations determined by the parent materials in which they developed, and generally corresponding to the three physiographic provinces of the County, provides a convenient basis for summarizing relevant soil attenuation factors (Figure 2.2).

Table 2.1. Soils Listed by Potential for Attenuation of Surface Applied Materials

Poorest Potential Score 0 to 30	Marginal Potential Score 31 to 40	Best Potential Score 41 to 50
Ab-Alluvial, wet (11)	Ca-Cathro muck (36)	Af-Altdorf slt lm (47)
Bt-Billett sandy lm (23)	Da-Dancy sandy lm (34)	Do-Dolph silt lm (43)
Co-Coloma lm sand (24)	Du-Dunnville very fine sandy lm (31)	Lu-Lupton muck (42)
Fr-Friendship lm sand (17)	Dx-Dunnville var (33)	Se-Seelyeville muck (41)
Kr-Kranski lm sand (27)	Ke-Kert silt loam (34)	
Le-Leola lm sand (25)	Ma,Mb-Markey muck (38)	
Mc-Marsh land (30)	Me-Meadland loam (34)	
Mf,Mg-Mecan series (29)	No-Norgo silt loam var (36)	
Mn,Mo,Mp,Mr-Meehan series (19)	Ov-Oesterle loam (39)	
Ms-Mosinee sandy lm (29)	Po-Point sandy lm (32)	
Oe-Oesterle sandy lm (28)	Rs-Rosholt loam (35)	
Pa-Pearl lm sand (26)	Rz-Rozellville loam (37)	
Pb-Plainbo lm sand (15)	Sh-Sherry silt lm (40)	
Pf,Pg,Ph-Plainfield series (20)	Vs-Vesper silt lm (36)	
Rf,Rg-Richford series (26)		
Rh-Rockers lm sand (25)		

Rk-Rock land (12)
Rm,Rn,Ro,Rp-Roscommon series (20)
Rr-Rosholt sandy lm (20)
Ru-Rosholt complex (23)
Wy-Wyocena sandy lm (26)

373,910 acres	114,860 acres	27,400 acres
72% of County	23% of County	5% of County

The soil associations formed in the outwash sand and gravel, and in the sand plain and drift provinces, account for 52% of the County, and include the Richford-Rosholt-Billett, Plainfield-Friendship, Leola-Pearl, and Roscommon-Meehan-Markey associations (Table 2.2). These soils are nearly level to gently sloping and are generally comprised of loamy sand, sandy loam, and sand, sometimes with coarse modifiers. These flat, coarse textured soils allow rapid infiltration and generally have high permeability. Some of the soils have higher organic matter content and/or greater depth, which are advantageous from a pollution attenuation perspective. Depth to groundwater in these soils is variable, ranging from less than one to greater than ten feet. These soils are usually cropped and often irrigated. As a general rule, these soils have low pollution attenuation capability. Exceptions are areas of finer-textured Rosholt loam and Oesterle loams, and Markey and Seelyeville organic soils. Area weighted composite rankings for these associations are 25, 19, 25, and 23 respectively. Overall, the outwash sand and gravel soil associations have an area weighted score of 23.

A majority of the population centers within the County are situated on these soil types. These communities include most of Stevens Point, and all of Park Ridge, Whiting, Plover, Rosholt, Amherst, Amherst Junction, Almond, Bancroft, Arnott, Custer, Stockton, Ellis, and Kellner. The extensive groundwater basin for the Stevens Point, Whiting, and Plover municipal water supplies lies almost entirely beneath areas covered by these soils. The low pollution attenuation ability, the numerous contaminant sources, and the potential severity of pollution impacts, dictate high management priority for these soil areas.

Table 2.2. Major** Soil Series of Glacial Outwash Province

Soil	Texture (A Hor)	Texture (B Hor)	Perm (B Hor)	Depth (A+B)	Drainage Class	Org Cont	pH	Slope
Roscommon	Muck	Medium Sand	Rapid	Mod	Poorly Drained	Low	Acid	Nearly Level
Richford	Loamy Sand	Loamy Sand	Mod Rapid	Deep	Well Drained	Mod	Acid	Nearly Level-Sloping
Meehan	Loamy Sand	Loamy Sand	Rapid	Mod Deep	Somewhat Poorly Drained	Low	Acid	Nearly Level
Plainfield	Loamy Sand	Loamy Sand/ Sand	Rapid	Mod Deep	Excess Drained	Low	Acid	Nearly Lev-V Steep
Friendship	Loamy Sand	Loamy Sand/ Sand	Rapid	Mod	Mod Well Drained	Low	Sly Acid	Nearly Level
Rosholt	Sandy Nearly Loam	Gravelly Sandy Loam	Mod Rapid	Mod	Well Drained		Mod	Acid Lev-V Steep
Billett	Sandy Nearly Loam	Gravelly Sandy Loam	Mod Rapid	Mod Deep	Well Drained		Mod	Acid Level

** 88% of the total area of this province

The soil associations related to the sandy glacial drift (eastern moraine province) account for 22% of the County, and include the Wyocena-Rosholt and Kranski-Coloma-Mecan associations (Table 2.3). These soils are gently sloping to very steep, with sandy loam to loamy sand textures. While steep slopes in finer textured soils would encourage more surface runoff, these soils are often coarse textured with high permeability, and therefore still have a high potential to pass pollutants to the aquifer. Good soil depth and topsoil organic matter content are somewhat helpful in preventing groundwater contamination. The flatter areas of these soils are generally cropped, while the steeper areas are pastured or in woodlands. Runoff from the steeper areas provides additional water to these flatter areas, resulting in a localized increase in the amount of water carried contaminants potentially infiltrating to the groundwater. Generally these soils have low pollution attenuation potential, except for areas of Rosholt and Oesterle loams with marginal potential. Area weighted numerical ranks for these two associations are 25 and 26 respectively. Drift soil associations overall score 26. Communities within areas covered by these soil types include Nelsonville, Polonia, and Peru.

The soil associations related to the drift-crystalline rock province and the Arnott moraine account for 16% of the County and include the Kert-Norgo variant, Meadland-Rozellville-Dolph, and Point-Dancy-Mosinee associations (Table 2.4). These soils are nearly level to sloping. A significant trend towards loam textures and moderate permeability indicates better soil pollution attenuation potential than for the soils formed in sandy glacial deposits. Drainage is variable and land use is a mix of crops, pasture, and woodland. A majority of these soils have marginal pollution attenuation potential. The fine textured, slowly permeable Altdorf and Dolph series have good attenuation potential. Area weighted numerical ranks for these three associations are 30, 39, and 29 respectively. Drift-crystalline rock soils score 34 overall. Communities located in areas covered by these soil types include Junction City and a portion of northwestern Stevens Point.

Table 2.3. Major** Soil Series of Sandy Drift Province

Soil	Texture (A Hor)	Texture (B Hor)	Perm (B Hor)	Depth (A+B)	Drainage Class	Org Cont	pH	Slope
Wyocena	Sandy Loam	Sandy Loam	Mod Rapid	Mod	Well Drained	Mod	Sly Acid	Gently Sloping
Rosholt	Sandy Loam	Grav Sandy Loam	Mod Rapid	Mod	Well Drained	Mod	Acid	Nearly Lev-V Steep
Kranski	Loamy Sand	Loamy Sand	Mod Rapid	Mod Deep	Excess Drained	Mod	Acid	Gently Sl-V Steep
Coloma	Loamy Sand	Loamy Sand/ Sand	Rapid	Deep	Excess Drained		Low	Acid Gently Slop-Sloping
Mecan	Sandy Loam	Sandy Loam/ Loamy Sand	Mod Rapid	Deep	Well Drained	Mod	Mod	Acid Gently Slop-Steep

** 83% of the total area of this province

Table 2.4. Major** Soil Series of Drift-Crystalline Rock Province

Soil	Texture (A Hor)	Texture (B Hor)	Perm (B Hor)	Depth (A+B)	Drainage Class	Org Cont	pH	Slope
Point	Sandy	Sandy	Mod	Mod	Somewhat	Mod	Acid	Nearly

	Loam	Loam/ Loam		Deep	Poorly Drained			Level
Dancy	Sandy Loam		Mod	Mod	Poorly Drained		Mod	Acid Nearly Level
	Loam/ Loamy Sand			Deep	Drained			
Meadland	Loam	Loam/ Sandy Loam	Mod	Mod	Somewhat Poorly Drained		Mod	Acid Nearly Level
Rozellville	Loam	Loam/ Sandy Clay Loam	Mod	Mod	Mod Well Drained		Mod	Acid Gently Sloping
Dolph	Silt Loam	Silty Clay Loam/ Clay	Slow	Mod	Somewhat Poorly Drained		Mod	Acid Nearly Level
Mosinee	Sandy Loam	Grav Sandy Loam	Mod	Mod Deep	Well Drained		Low	Acid Gently Sloping

** 72% of total area of this province

There are also two associations related to alluvial or organic deposits that account for 10% of the County, and include the Alluvial land, wet-Dunnville, and Markey-Seelyeville-Cathro associations (Table 2.5). These soils are nearly level to gently sloping, and are often subject to flooding or ponding. The predominant soil texture is sapric muck or flood plain alluvial deposits, and permeability is generally high. These areas are often left in native vegetation, although some pasturing and specialty cropping occurs. Pollution attenuation potential ranges from poor to good. Deep organic soils, especially the Lupton and Seelyeville series, are rated favorably for pollution attenuation. Area weighted numerical ranks for these two associations are 18 and 38 respectively, with an overall score of 34. A portion of the Stevens Point, Whiting, and Plover urban area is located on these soils along the Wisconsin River corridor.

Table 2.5. Major** Soil Series of Alluvial or Organic Origin

Soil	Texture (A Hor)	Texture (B Hor)	Perm (B Hor)	Depth (A+B)	Drainage Class	Org Cont	pH	Slope
Markey	Muck	Muck	Mod Rapid	Mod Deep	Very Poorly Drained	High	Neut	Nearly Level
Seelyeville	Muck	Muck	Mod Rapid	Deep	Very Poorly Drained	High	Sly Acid	Nearly Level
Cathro	Muck	Muck	Mod Rapid	Mod Deep	Very Poorly Drained	High	Acid	Nearly Level
Alluvial	Sand-Silt Loam	Sand-Silt Loam	Var	-	Poorly Drained	Very Low	-	Nearly Level
Dunnville	Very Fine Sandy Loam	Very Fine Sandy Loam	Mod Rapid	Mod Deep	Well Drained	High	Acid	Gently Sloping

** 87% of total area of alluvial and organic soils

The preceding discussion indicates that a majority of the County's soils have little pollution attenuation potential. An evaluation of the pollution attenuation potential for Portage County soils using the WGNHS system was completed in 1987 by Good and Madison. Their analysis also clearly illustrates the low pollution attenuation potential for soils over much of the County, especially in the sand plain and other sandy outwash areas. Some moraine soils have marginal potential, and only a relatively small area in the northwest has good potential. No Portage County soils rank in the best attenuation classification.

The Stevens Point-Whiting-Plover urban area is in an especially vulnerable location. Obviously, soil conditions can vary considerably across a given area, and site specific evaluations of soil pollution attenuation potential are necessary for evaluating specific developments or land uses. It is also important to realize that numerical systems generalize the complex physical, chemical, and biological pollution attenuation processes, and that characteristics of individual pollutants (such as solubility or leachability) should also be considered.

C. Evaluation Of Subsurface Materials

The most important characteristics to be considered in the evaluation of the pollution attenuation potential of subsurface materials, are the unsaturated zone thickness, and texture and permeability of the materials.

In the sand plain province, very little subsurface pollution attenuation potential exists. The well sorted, thick, homogeneous, coarse textured sands and gravels that constitute the saturated and unsaturated zones of this province have high permeability, suggested by the production of water in numerous high capacity wells. A simple index of the ability of these subsurface materials to transmit water is the specific capacity of the irrigation wells.

The specific capacity is defined as the ratio of the water yield to water level drawdown in a well, and is a function of the aquifer materials and the particular well construction. It is, therefore, valuable as a general indicator of aquifer permeability. The average specific capacity for 52 irrigation wells in the sand plain province is 60 gallons per minute per foot of drawdown (Holt, 1965). For comparison, typical specific capacities for wells in sandstone in the central Wisconsin area range from 8 to 33 gpm/foot (Devaul and Green, 1971).

The hydraulic conductivity or coefficient of permeability is a direct measure of the potential water transmitting ability of the material. As reported by Holt (1965), the average hydraulic conductivity at four wells in the sand plain, as determined from pumping tests, is approximately 1,900 gallons per day (gpd) per square foot (.09 cm/sec). In comparison, the hydraulic conductivity for silt may be less than 1 gpd/square feet (.00005 cm/sec).

The thickness of the unsaturated zone in the sand plain province varies from less than one (1) foot in some areas of the southwestern portion of the province, to over thirty (30) feet in other areas. With the combination of coarse, highly permeable materials and relatively shallow depth to groundwater, little contact time and pollution attenuation can be expected. For management purposes, the sand plain province area, characterized by highly vulnerable soils, should be considered to have minimal overall pollution attenuation capability and should be managed accordingly.

In the drift province, the subsurface materials were more irregularly deposited than in the outwash sand plain province. Aquifer characteristics can change considerably over short distances, and with depth, in any given location. As previously noted, the glacial till comprising the moraines of the drift province is

an unsorted mixture of clay, silt, sand, gravel, and boulders, with the sand size fraction predominating. Although the permeability in this area is lower overall than in the well sorted, fairly uniform outwash to the west, the predominance of coarse materials reduces the potential pollution attenuation.

High capacity wells in the drift province generally utilize the outwash areas associated with the moraines. These areas are hills, terraces, and deltas of washed till deposits and stratified silt, sand, and gravel. These materials have higher permeability than the till moraines, but lower permeability than the sand plain outwash. The average specific capacity for 11 wells in outwash areas of the drift province is 24 gallons per minute per foot of drawdown, compared to the average 60 gpm/foot for the sand plain (Holt, 1965).

The thickness of the unsaturated zone in the drift province is more variable than in the sand plain, and is generally in the range of 20 to 200 feet. Because of the high degree of variability, it is difficult to generalize the pollution attenuation potential. In general, the greater unsaturated zone thickness and the slightly lower permeability of the subsurface materials indicate a poor to moderate attenuation potential. Combined with variable soil pollution attenuation ability, the province overall rates a poor to marginal pollution attenuation capability. Due to the heterogeneous nature of the area and the predominance of coarse textured materials, it would be advisable to be conservative without site-specific subsurface data.

The drift-crystalline rock province is considerably different from the rest of the County, in that the basement granitic bedrock is close to the surface, and the unconsolidated aquifers above it are very limited. The depth to bedrock is generally less than 20 feet, and the depth to groundwater is generally less than 10 feet. Seasonally, depths to groundwater can decrease to less than one foot.

Given the very thin or nonexistent unsaturated zone, there exists little or no second line defense against pollutants regardless of the nature of the subsurface materials. Although some of the soils ranked moderate to good in pollution attenuation, this area of the County should be considered vulnerable overall, given the shallow depth to groundwater and bedrock.

The WGNHS utilized a numerical ranking system in Rock County to evaluate subsurface materials. Map overlays, with type and depth of subsurface materials, and depth to groundwater ranges were utilized to identify subsurface areas that are most, moderately, and least vulnerable to pollution. The most vulnerable areas occur where shallow bedrock or thick sand and gravel is combined with shallow depth to groundwater. The least vulnerable areas occur where medium to thick till is combined with a depth to groundwater of more than 50 feet. Using this system, the sand plain and drift-crystalline rock provinces are ranked as the most vulnerable to pollution. The drift province receives the intermediate rank of moderate vulnerability to pollution because of greater depth to water.

D. Groundwater Flow And Direction In The Saturated Zone

The direction and rate of groundwater flow are extremely important when considering the potential impact of pollutant sources. If the attenuation factors are not adequate to prevent a pollutant from reaching the aquifer or to dilute its adverse impacts, analysis of groundwater flow is necessary to predict where such impacts will occur, and to devise clean-up strategies, if necessary. Analysis of the groundwater flow is also important to develop pollution prevention strategies to protect critical areas, such as community well fields.

Using the water table elevation map (Figure 2.5), generalized groundwater flow directions can be estimated. There are three groundwater basins in the County. The sand plain and the drift-crystalline rock provinces west of the groundwater divide are within the Wisconsin River basin. The drift province east of the groundwater divide has two major drainage basins, the Tomorrow-Waupaca River and the Little Wolf River watersheds.

Within these basins, general groundwater flow is from the basin divides, which generally coincide with the topographic highs (except near Almond), toward the major stream in the basin. There are complex local flow systems superimposed on the general flow. For example, a less permeable, buried sandstone

ridge just east of Plover and Whiting blocks some of the westward groundwater flow toward the Wisconsin River and increases discharge to the Little Plover River. High capacity wells can create local flow systems that can temporarily reverse the natural direction of flow, drawing surface water out of streams and into the aquifer. This has been noted in the Plover River adjacent to the Stevens Point wellfield, and in the Little Plover River east of I-39. Man-made drainage ditches can intercept groundwater flow at considerable depth, as documented in the Buena Vista basin (Bahr, 1990). As a further complication, groundwater flow systems can also change seasonally, especially near groundwater divides. Detailed site studies are needed to define this level of flow detail.

The County groundwater flow map can be used in conjunction with the soil attenuation mapping, and identified pollutant sources, to delineate special priority areas (such as wellhead protection zones) as needed, and to serve as a preliminary screening tool for more detailed studies.

While all wells, private and municipal, should be considered for protection, the municipal well fields have historically been a higher priority because of the concentrated number of users dependent on the water

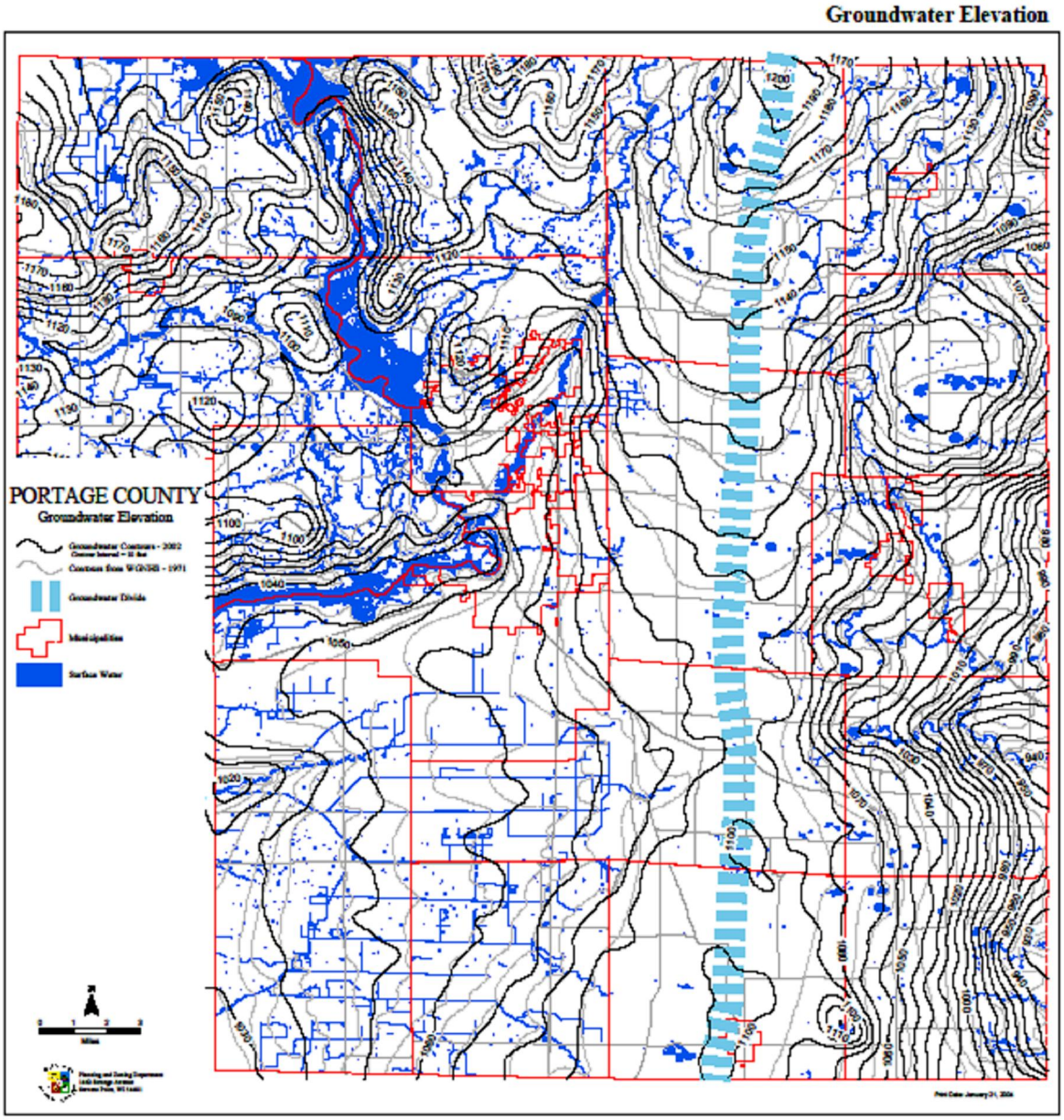

Groundwater Elevation
PORTAGE COUNTY
Groundwater Elevation

Figure 2.5

Municipal Well Recharge Areas

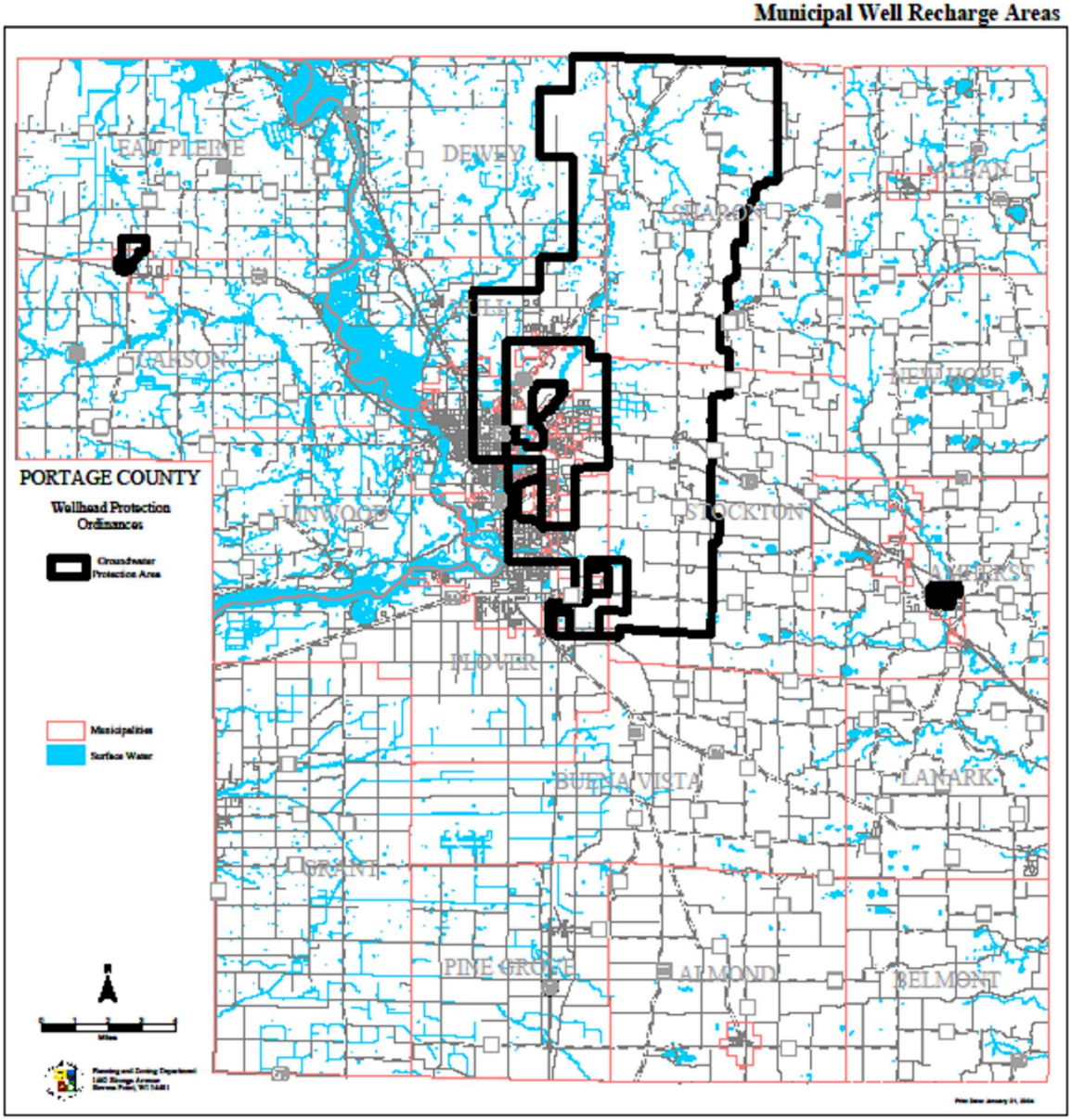


Figure 2.6

systems. The groundwater recharge areas for municipal wells, and the associated wellhead protection areas, are illustrated in Figure 2.6.

The Stevens Point, Whiting, and Plover well fields have received considerable attention. As shown on the recharge area map (Figure 2.6), the well fields are primarily associated with the sand plain province areas highly vulnerable to pollution. The interaction of the Stevens Point well field with the Plover River has complicated the delineation of the well field's priority recharge area. Detailed studies of groundwater flow paths in the vicinity of the well field have provided additional support for priority groundwater protection management options for this developing area.

The rate of groundwater movement within an aquifer is related to the slope of the water table, the media properties (permeability), and the fluid properties (viscosity). The water velocity can be approximated from the formula: $V=KI/n$ where V is velocity in feet per day, K is the hydraulic conductivity in feet per day, I is the hydraulic gradient in feet per foot, and n is the effective pore volume as a fraction of total media volume. The hydraulic conductivity factor includes consideration of media and fluid properties, and is most often determined through aquifer pump tests. The hydraulic gradient is the slope of the water table and can be calculated from Figure 2.5. The hydraulic gradient reflects the specific combination of changes in permeability of the media, variations in the aquifer thickness, and variations in recharge and withdrawals from the system. The n value is needed in order to correct the velocity for the true cross-sectional area that actually transmits the water.

For the sand plain province, Holt (1965) noted an average hydraulic conductivity value of 1,900 gpd/sq.ft. or 252 feet/day, as determined from pump tests of four wells. The n value is approximately 22%. The water table slope for the sand plain ranges from 3 to 25 feet/mile and averages 5 feet/mile. The calculated velocity, therefore, ranges from 0.7 to 5.4 feet/day and averages 1.1 feet/day. However, recent research has shown that differential flows can exceed average flows by several fold, (Kung, 1995) in some cases reaching 100 feet per day.

Velocity of groundwater flow is much more variable in the drift province. The sandy drift of this province has a lower overall hydraulic conductivity than the sand plain outwash, and can be quite variable over short distances. Although the hydraulic gradient is steeper, ranging from 5 to 40 feet/mile, the average groundwater velocity in the sandy drift is probably less than 1 foot/day. Velocities in well sorted outwash areas, and through stream deposits, within the drift province, are probably more similar to those of the sand plain, depending on the specific hydraulic gradient.

The drift-crystalline rock province is also more difficult to generalize than the sand plain. The thin unconsolidated drift and outwash deposits over impermeable bedrock have variable hydraulic conductivity and porosity. The lower permeability of these materials in general would indicate groundwater flow rates considerably less than 1 foot/day. Within significant fractures, however, groundwater can travel much further and faster than would otherwise be expected.

Withdrawals from high capacity wells (municipal, irrigation, industrial) in the sand plain province can considerably increase local flow rates. Within the steeper region of the well's cone of depression, flow rates can increase to as high as 1,000 feet/day, with a strong vertical component. This can greatly increase the downward migration of fertilizers, pesticides, gasoline, and other materials discharged to the ground surface. Another result can be vertical mixing of contaminated water throughout portions of the aquifer, eliminating the possibility of obtaining better quality water deeper in the aquifer.

SECTION 2.4 SUMMARY OF ENVIRONMENTAL SETTING

The preceding sections have discussed the various environmental factors that must be considered for the proper management of groundwater resources. Review of any potentially polluting activity, in terms of soil and subsurface attenuation and groundwater flow, is a logical point of beginning for groundwater management planning.

In Portage County, the areas of low pollution attenuation potential for soil and subsurface materials include most of the sand plain province. This highly vulnerable zone includes the groundwater basins for the water supplies for a majority of the County population.

Much of the rest of the County has only slightly better attenuation potential. Obviously, composite generalizations of pollution vulnerability and potential pollutants facilitate overall management plan development. Yet great care must be exercised in the interpretation of these generalizations because of the complex nature of the environmental processes and the highly variable nature of the pollutants.

SECTION 3.0 LAND USE AND POTENTIAL POLLUTION SOURCES

SECTION 3.1 INTRODUCTION

There are many potential sources of groundwater contamination in Portage County. Some are naturally present in our groundwater, but most are related to our uses of the County land and water resources. The increased residential development in rural areas, in close proximity to agriculture, exposes more of our citizens each year to all of the nutrients and pesticides historically leached to groundwater. The task of inventorying the potential sources is complicated by temporal changes in land uses and the dynamic state of our knowledge of groundwater pollutants. Many sources of pollutants have been present long enough to have established ñtrack recordsò, either positive or negative. Table 3.1 lists basic groundwater pollution sources that are known to exist in Portage County. The list is divided into aboveground and underground sources. The environmental assessment contained in Section 2 describes the importance of the soil layers for pollution attenuation. Any contaminants buried or discharged below the soil have an inherently greater likelihood of adversely impacting groundwater quality. The list is further divided into point (specific location) and nonpoint (widespread) sources.

Many of the point sources were addressed in the 1988 Plan and are able to be carefully managed and continually monitored. Such facilities include the County landfill, fertilizer and pesticide storage and sales, petroleum product storage tanks, road salt storage, and manufacturing plants. Other point sources, such as private onsite wastewater treatment systems and manure storage facilities, are not as easily managed or strictly regulated, but are constructed to prevent groundwater contamination.

Nonpoint sources, including agricultural nutrients and chemicals used for production, pesticides used along road and utility rights-of-way, and land application of biosolids, are much more difficult to manage without allowing detrimental impacts on our groundwater and surface water resources.

Table 3.1. Major Sources of Groundwater Pollutants

Aboveground Point Discharges

Stormwater infiltration basins
Accidental spills
Aboveground storage tanks

Aboveground Nonpoint Discharges

Urban runoff
Lawn and garden fertilizers and pesticides
Rights of way maintenance pesticides
Road salt
Biosolids land application
Agricultural fertilizers and pesticides
Manure spreading

Underground Point Discharges

Private onsite wastewater treatment systems (POWTS)
Sewer leakage
Cemeteries
Unused wells
Backsiphoning
Landfills
Underground storage tanks
Petroleum products pipelines

Manure Storage Facilities

SECTION 3.2 LAND USE AND POPULATION SUMMARY

Table 3.3 summarizes Portage County land use in the year 2000. Agriculture is the largest individual land use in the County, comprising approximately 35% of the total land area of the County. The amount of irrigated agricultural land in the County is steadily increasing, though currently at a slower rate than in previous decades, due primarily to the conversion of forested sand plain lands to potato and other vegetable crop production. Approximately 40% of all County cropland, or 75,000 acres, is irrigated. This is an increase from 2,802 acres in 1954 and an increase of 25,000 acres (50%) since the 1988 Plan was written.

Forest lands rank second in total area, accounting for about 26% of all lands. This category includes pine plantations, as well as the naturally occurring stands of timber. Wetlands (regulated under DNR and Army Corps of Engineers authority) make up an additional 17%. In total, agricultural and forest lands, and wetlands comprise nearly 78% of the County.

Table 3.3. Year 2000 Land Use Summary for Portage County

Land Use Category	Acres	% of County
Agriculture	185,194	35%
Forest	138,088	26%
Wetlands (Swamp and Waste)	88,509	17%
Urban (Incorporated) Areas	22,694	4%
Rural Development	13,471	3%
Transportation Right-Of-Way	15,095	3%
Water Bodies	12,473	2%
Other	51,289	10%
	526,813	100%

Source: Portage County Planning and Zoning

Urban areas, including the City of Stevens Point and the nine incorporated villages in the County, encompass about 4% of the land area. The Stevens Point-Whiting-Plover-Park Ridge urban area itself covers about 30 square miles. Rural development, including residential and commercial developments in unincorporated towns, encompasses about 3% of the land. Taken together, these urban and rural developments account for approximately 7% of the County's land area.

Transportation right-of-way includes those lands used for State, County, and town roads, as well as railroads. The right-of-way required for these facilities is larger than the pavement or track width itself. This use comprises about 3% of the County's land, not including road rights-of-way in the urban areas.

Natural surface water bodies constitute over 2% of the land area. The DuBay, Stevens Point, and Biron flowages of the Wisconsin River represent the majority of this acreage.

The "other" category, miscellaneous uses not otherwise identified in this land use summary, includes gravel pits and disturbed lands. These ñotherò lands constitute 10% of the land area.

The year 2000 population of Portage County is 67,182, and is distributed between: 1 city, 9 villages, and 17 towns (Table 3.4). A majority of the County population (55.5%) is concentrated in the urban area, consisting of the City of Stevens Point and the Villages of Whiting, Park Ridge, and Plover. Approximately 40% of the County population is located in the 17 towns, and the remaining 4.5% is located in the 6 "rural Villages" outside of the Stevens Point urban area.

The County population has fluctuated from decade to decade, but can be characterized by slow and steady growth that is projected to continue (Table 3.5). Much of the recent growth in the urban area of Stevens Point ï Whiting ï Plover is in the commercial development along Highway 10 East, and the

business developments east of I-39, and along County B and Highway 54. Anticipated future growth in the urban area will be within the Sewer Service Area.

Rural home development continues to rise, with more and more individuals who move to the "country" commuting to jobs in the urban areas. In addition to Stevens Point and Plover, rural residents in Portage County increasingly commute to Wausau, Wisconsin Rapids, Marshfield, and the Appleton areas. Nonfarm, rural residents continue to comprise over 80% of the population of the unincorporated towns in Portage County.

The County's population is projected to increase by a total of 14,073 people from 2000 to the year 2020. It is anticipated that much of this new growth will continue to take place in urban fringes and in the outlying townships. The Stevens Point ï Whiting ï Plover urban area can be expected to continue its growth outward into the Towns of Plover, Hull, Stockton, and to a lesser degree, the Towns of Linwood and Carson.

Presently, approximately 30,000 people, or 45% of the County population, depend on private wells for their water supply. Only Stevens Point, and the Villages of Plover, Whiting, Junction City, and Amherst have municipal water systems. Municipal sewage treatment systems serve residents in Stevens Point and the Villages of Park Ridge, Whiting, Plover, Junction City, Almond, Amherst, and Rosholt. This leaves about 29,000 people discharging their sewage to POWTS. Due to political and economic factors, municipal services will probably not be extended to much of the anticipated population growth in the unincorporated urban fringe and rural development areas, **but should be strongly considered where available, especially in municipal well recharge areas.**

Table 3.4 Portage County Population (2000)

Municipality	Population	% of Total County Pop
T Alban	897	1.3
T Almond	679	1.0
T Amherst	1,435	2.1
T Belmont	623	0.9
T Buena Vista	1,187	1.8
T Carson	1,299	1.9
T Dewey	975	1.5
T Eau Pleine	931	1.4
T Grant	2,020	3.0
T Hull	5,493	8.1
T Lanark	1,449	2.2
T Linwood	1,111	1.7
T New Hope	736	1.1
T Pine Grove	904	1.3
T Plover	2,415	3.6
T Sharon	1,936	2.9
T Stockton	2,896	4.3
V Almond	459	0.7
V Amherst	964	1.4
V Amherst Junction	305	0.5
V Junction City	440	0.7
V Nelsonville	191	0.3
V Park Ridge	488	0.7
V Plover	10,520	15.7
V Rosholt	518	0.8
V Whiting	1,760	2.6
C Stevens Point	24,551	36.5
Total for County	67,182	100.0

Table 3.5. Portage County Population Trends 1900-2020

Source	Year	County Population	% Change
Census	1900	29,483	18.9
Census	1910	30,945	5.0
Census	1920	33,649	8.7
Census	1930	33,827	0.5
Census	1940	35,800	5.8
Census	1950	34,858	-2.6
Census	1960	36,964	6.0
Census	1970	47,541	28.6
Census	1980	57,410	20.8
Census	1990	61,405	7.0
Census	2000	67,182	9.4
Projected	2010	74,786	11.3
Projected	2020	81,255	8.7

Sources: U.S. Census, Wisconsin Department of Administration Population (WDA) Estimates

Land use maps have been developed for the seventeen Towns in Portage County, presenting detailed information on the current distribution of land uses. In addition to the land use maps previously adopted by the individual municipalities, the County is currently engaged in a Comprehensive Land Use Planning process involving most of the County municipalities. This Comprehensive Planning initiative will be completed in 2005. Several of the major elements of the Countywide Comprehensive Plan involve aspects of groundwater management.

SECTION 3.3 MANURE STORAGE STRUCTURES

There are currently over one hundred manure storage impoundments in Portage County. (Figure 3.1) The animal waste, often including the barnyard runoff and milkhouse waste is stored (for up to six months) until soil and crop conditions allow proper application to maximize nutrient availability and prevent runoff to streams. Many of these impoundments are very well constructed, watertight concrete, steel tanks or clay lined manure pits. The threat to groundwater is minimal provided these structures are properly maintained and managed, and the manure applied correctly. Other storage structures were built prior to current ordinance and standards, and groundwater protection is not as certain. The Land Conservation Division encourages farmers with older storage structures to upgrade (or abandon) them, sometimes offering cost sharing to accomplish the goal. Over the past years, several farmers with older systems have closed their operations due to the poor economic conditions.

Innovative manure management systems, such as that operated by Gordondale Farms of Nelsonville, can greatly decrease the amount of manure that must be stored. The anaerobically digested manure can be reused as animal bedding, or used as a soil amendment to enhance soil health by increasing organic matter content. During digestion, methane gas is generated and used to produce electricity, thus reducing greenhouse gases released to the atmosphere. The remaining effluent, with greatly reduced odor, must still be stored until it can be landspread. Advanced treatment techniques are being investigated to further reduce the volume of effluent, or completely eliminate the need for landspreading.

SECTION 3.4 PETROLEUM PRODUCT PIPELINES

Petroleum products can seriously pollute groundwater, posing a threat to health and property. Gasoline is less dense than water and, therefore, floats on the groundwater surface, and may infiltrate into basements and sewers, causing a significant fire and explosion hazard. Drinking water supplies contaminated with petroleum products are objectionable because of the taste, odor, and health concerns. Volatile organic

Manure Storage

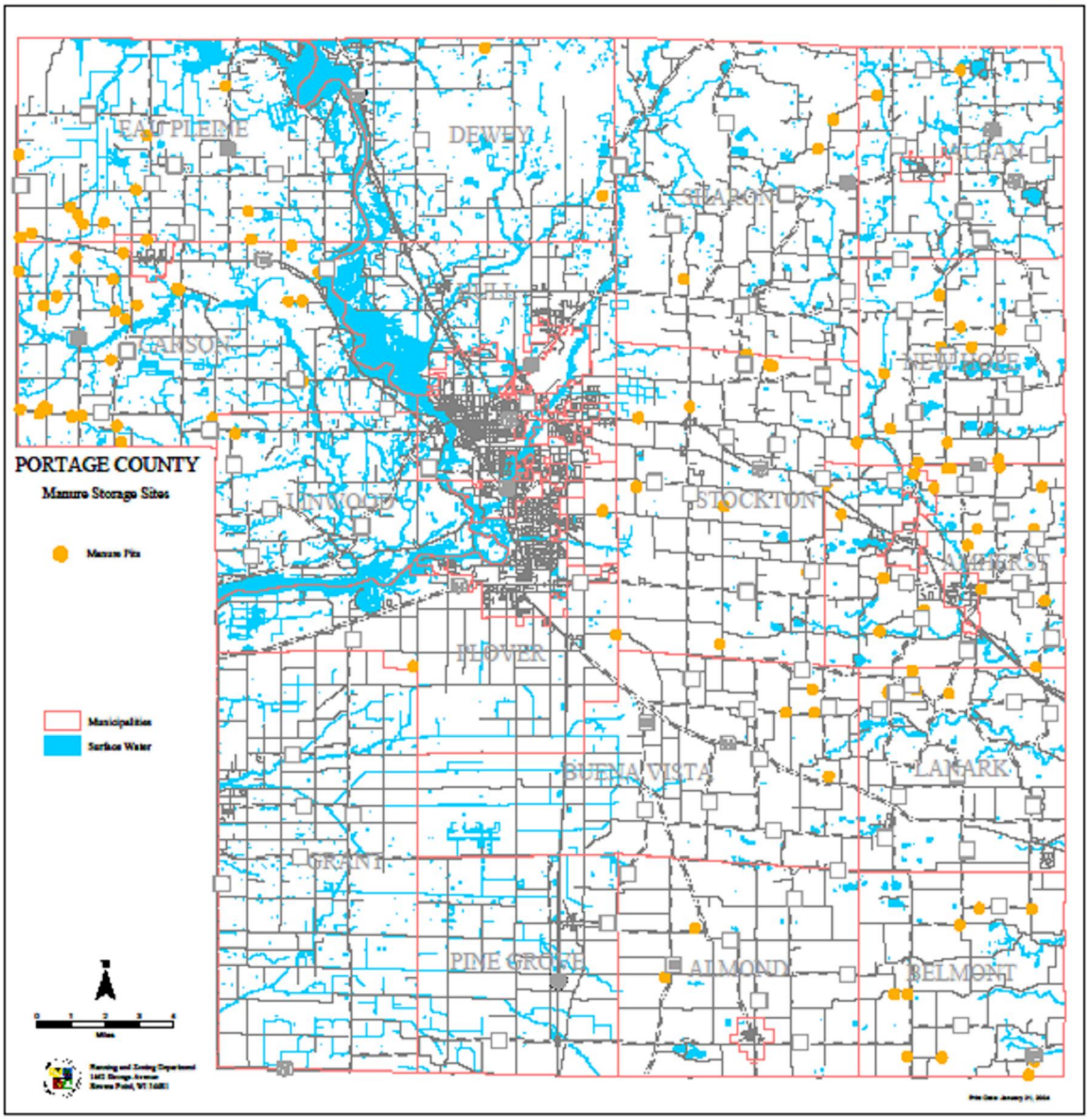


Figure 3.1

Petroleum and Natural Gas Pipelines

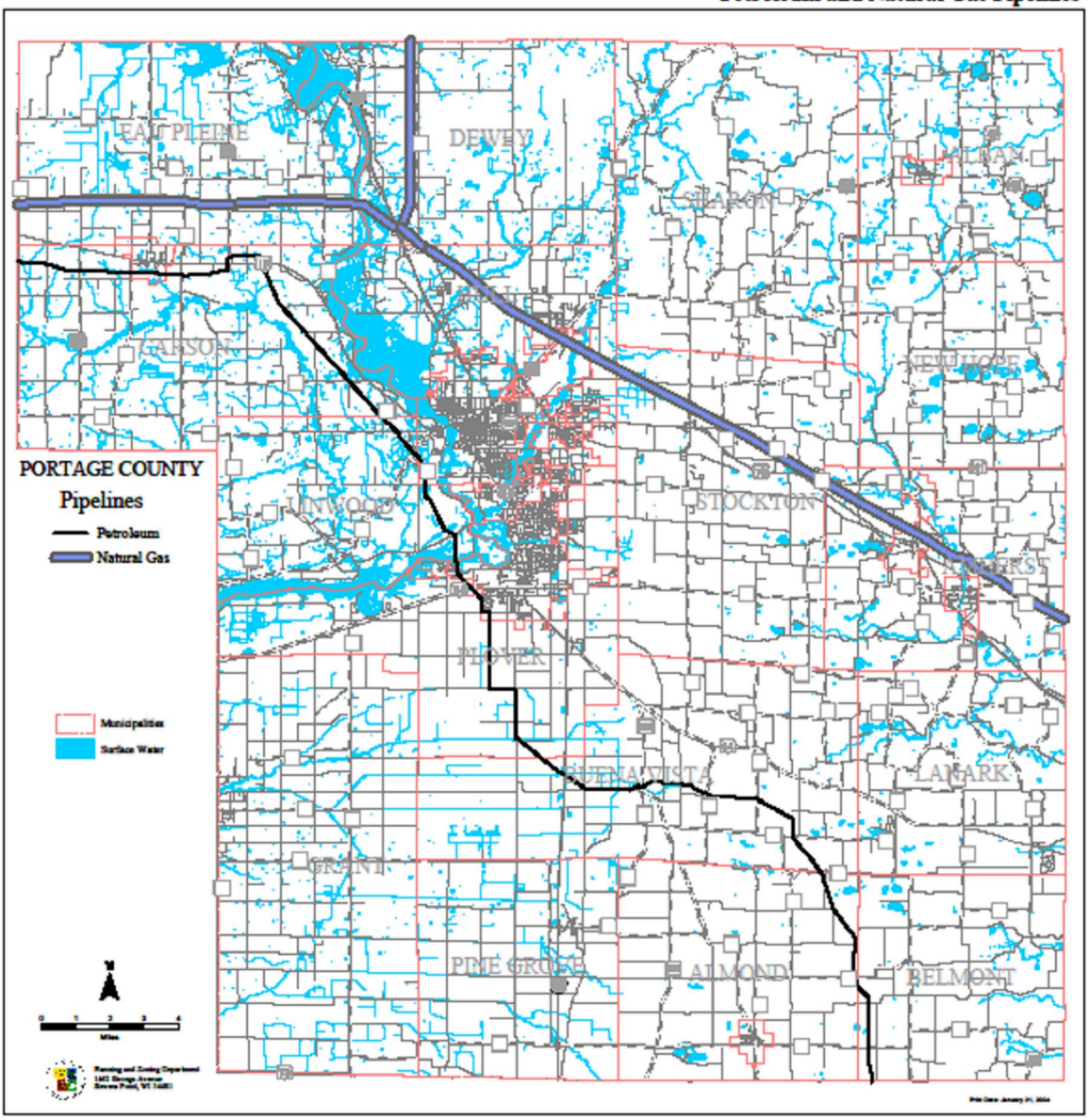


Figure 3.2

compounds are related to a host of health problems. For example, benzene, a component of common gasoline, is strongly linked to leukemia in humans and can remain above the public health standard of 0.67 parts per billion (micrograms per liter) even after considerable dilution.

There is one petroleum product pipeline in Portage County. The Koch Refinery pipeline originates at the Koch Refinery south of Minneapolis-St. Paul, passes through Carson and Eau Pleine, and terminates at the above-ground tank storage farm at the junction of Highways 10 and 34, east of Junction City.

Maximum storage capacity of the tank farm is approximately 19 million gallons. The environmental setting for the tank farm area can be generalized as RzB and PoA soils, with a low potential for groundwater contamination.

All storage tanks are diked with materials from the site and have high level alarms. Spills within the storage tank area, such as at the truck loading area, are directed to a separator for recovery. Koch also maintains a contingency plan, personnel, and equipment to respond to and clean up spills. There are no monitoring wells at the site.

The pipeline continues southeast from the tank farm through the Towns of Carson, Linwood, Plover, Buena Vista and Almond. Several leaks in the 1980ôs resulted in reconstruction of major portions of the pipeline, and installation of monitoring devices. The 12 inch pipeline is used to transport fuel oil, gasoline, and liquid propane. Length of the pipeline within Portage County is approximately 50 miles (Figure 3.2). The pipeline is maintained with cathodic and internal corrosion inhibitors. Input-output flows are computer monitored for rapid detection of any breaks in the pipeline. **A natural gas pipeline is also shown in Figure 3.2, but has much more limited potential for groundwater contamination.**

SECTION 3.5 BIOSOLIDS LANDSPREADING

Biosolids, formerly referred to as sludge, are byproducts of manufacturing (food, paper) and sewage treatment processes. Also included is the septage (see Sec. 3.13) pumped from septic and holding tanks. These materials have variable concentrations of useful soil amendments, which when properly applied and incorporated into the soil, can be utilized by agricultural crops. These materials also contain varying levels of potential groundwater contaminants. Potentially hazardous components of sludge include heavy metals such as cadmium, chromium, lead, and mercury, pathogenic bacteria and viruses, nutrients such as nitrogen and phosphorus, and high salt content. These materials may contaminate groundwater, if applied in excess of the land's ability to seasonally or cumulatively assimilate the materials, or if site conditions exist that encourage leaching of the materials out of the active soil zone, such as in sandy soils under irrigation.

A significant acreage, widely distributed throughout the County (Figure 3.3), has been approved by the Department of Natural Resources (DNR), for land application of over a dozen different types of biosolids. Because the sites are reviewed by DNR staff, based on the information submitted by each individual biosolids applicator, several sites in Portage County have been approved for application of biosolids by several different haulers for the spreading of several different materials on the same site. This situation could result in over application and discharge of contaminants to groundwater. None of the approved sites are presently required to have monitoring wells, although some private wells in the vicinity of municipal sludge spreading sites are tested. DNR does have the authority to require whatever groundwater monitoring and plant tissue analysis that is deemed necessary.

Municipal sewage treatment plant sludge, while highly pretreated for removal of pathogens and nutrients, is closely regulated by DNR staff, and tested prior to land application by the licensed sewage treatment plant operator employed by the city or village. Septic and holding tank waste, by contrast, is not tested prior to application even though it may be treated with lime to kill pathogens prior to land application. Biosolids from food processing (whey, vegetable byproducts) and paper production have individualized

nutrient and contaminant makeup, and are generally regulated based on the most limiting groundwater contamination standard. Nutrient management plans may be required to provide for plant uptake of the available nutrients. Typically sludge loading rates are calculated based on specific sludge nitrogen

Biosolids (Sludge and Septage) Landspreading

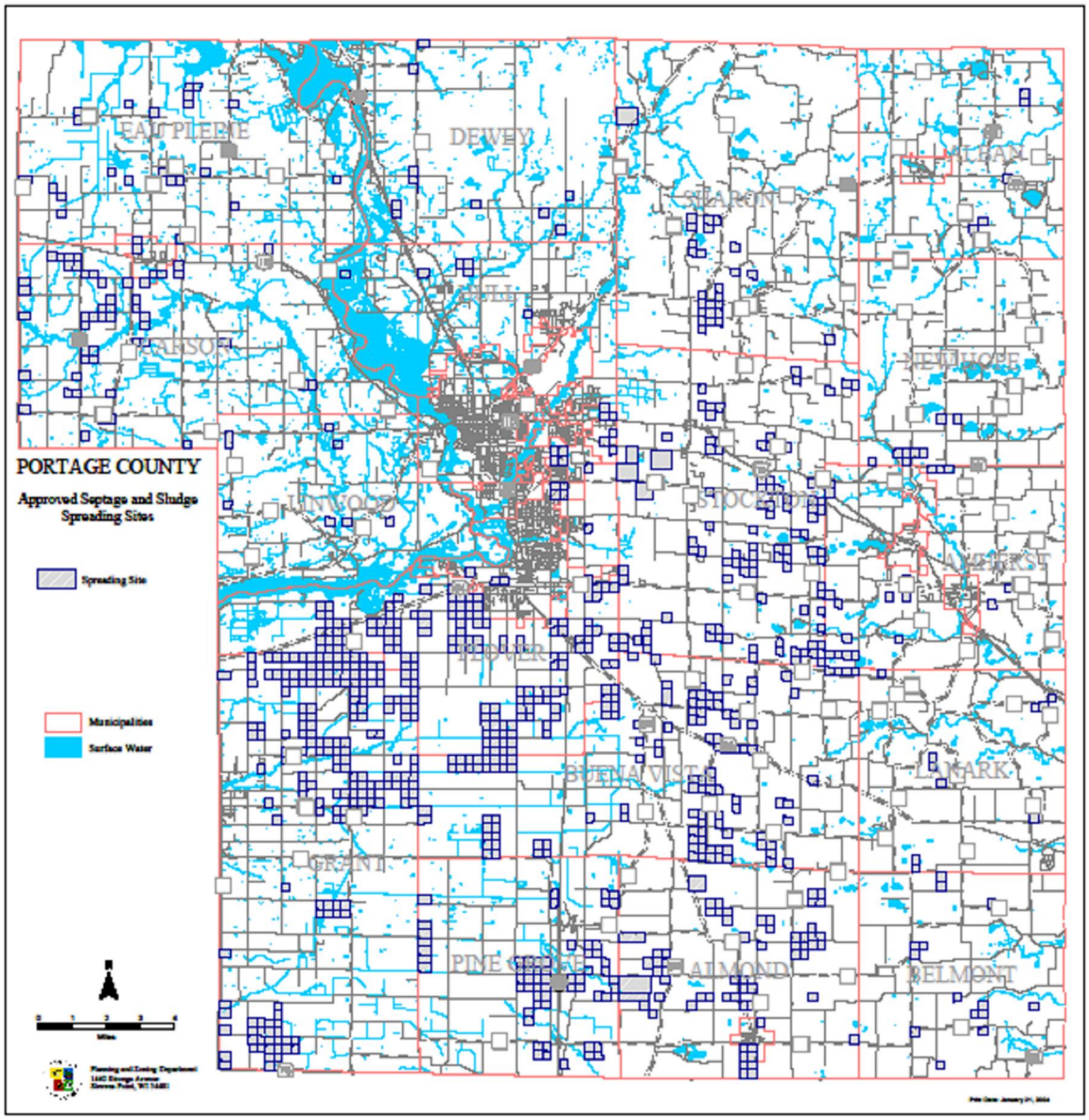


Figure 3.3

Well Abandonment

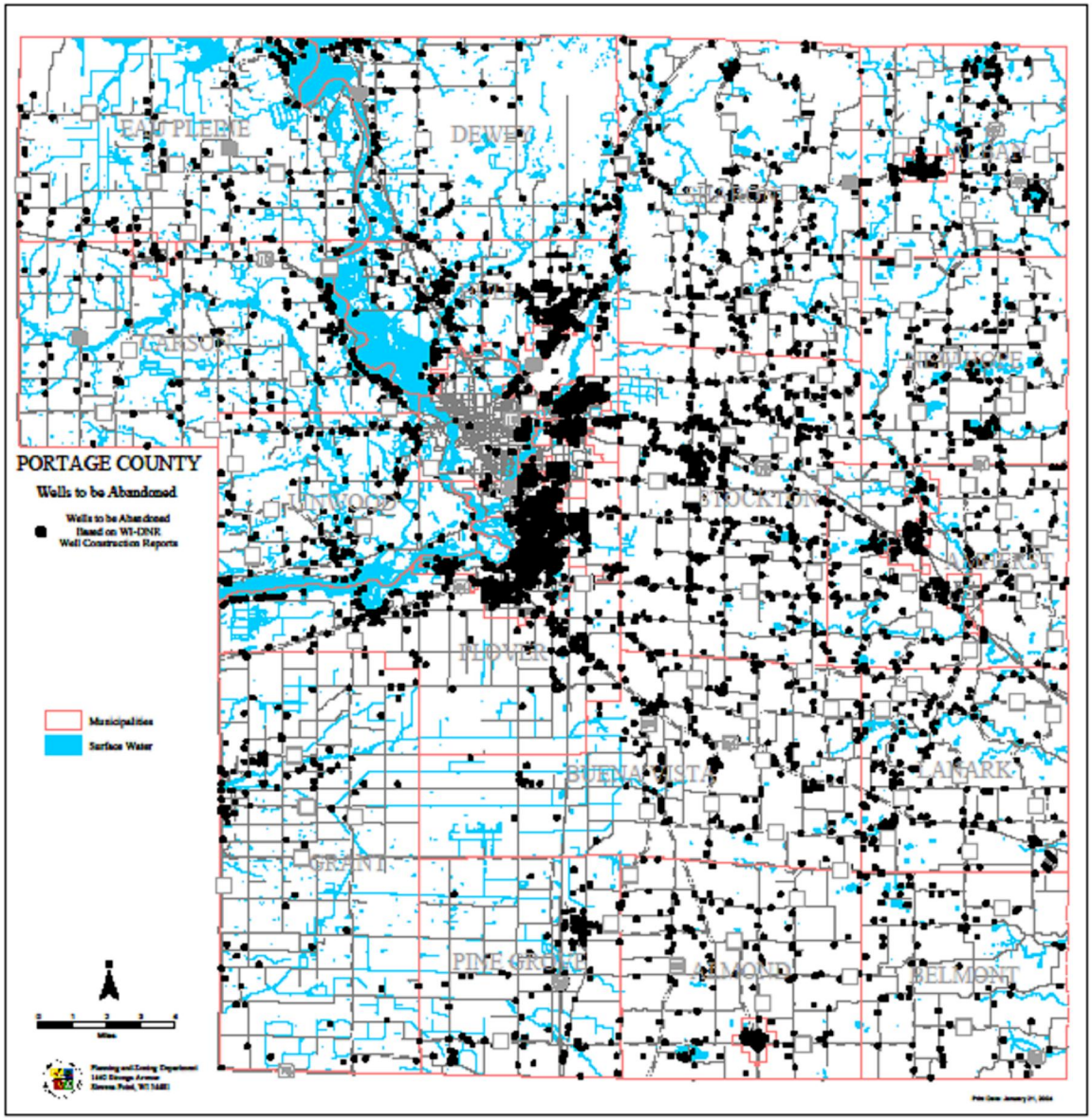


Figure 3.4

content, crop nitrogen needs, and site. Sludge can be applied at a maximum loading rate that will meet the total nitrogen requirement of the crop. However, at maximum loading rates, DNR requires farmers to

track nitrogen loading to prevent leaching. Most sludge loading rates are based on 30% of the total nitrogen need of the crop, because, at this level DNR does not require nitrogen tracking.

SECTION 3.6 SPRAY IRRIGATION OF WASTEWATER

Spray irrigation of wastewater from food processing operations is a common method of treatment and disposal utilizing vegetation, which is harvested to remove nutrients, and the active soil zone over a wide area. Food processing wastewater has significant levels of nutrients, such as forms of nitrogen, dissolved solids, and oxygen demanding materials. The wastewater may also contain any other materials associated with the agricultural product, though pesticide regulations prohibit applications of chemicals to crops too close to harvest.

There are 3 spray irrigation systems currently under permit by the DNR in Portage County: American Potato, McCain Foods, and Del Monte. Extensive groundwater quality monitoring is required as a provision of the DNR permits. Typical test parameters include groundwater elevation, organic nitrogen, ammonia nitrogen, nitrate-nitrite nitrogen, total dissolved solids, BOD5, COD, pH, conductivity, and chlorides. Sampling frequency ranges from biweekly to quarterly. Specific testing requirements vary with the WPDES permit.

SECTION 3.7 UNUSED OR UNSAFE WELLS

Unused wells represent a major threat to the groundwater, especially if left open to whatever contaminants may find their way downward. Unused basement wells, fairly common in Portage County, can provide an excellent route to groundwater for sewage, heating fuel, and anything else spilled on a basement floor. During a house fire, significant amounts of contaminated water can be flushed into an unused well in a basement. Even though a well may no longer be useful, whether due to inadequate water production or other reason, it still constitutes a direct connection to the groundwater. It is estimated, based on DNR records of replacement wells, that there are at least two thousand unused, private wells in Portage County. (Figure 3.4) The number is probably significantly higher, since many driven point wells, replaced by property owners, were never recorded with DNR.

Each of the municipalities with a municipal water supply system has an ordinance regulating private wells within its municipal boundaries. The ordinances generally require that an unused well be properly abandoned to prevent contamination of the groundwater, possibly even the groundwater supplying the municipal wells.

Even in a municipality with a public water supply system, a property owner has the option to use his private well, and unless there is a problem with improper location or construction, a well in use is generally not a threat to the groundwater. These private wells are required to be inspected for proper construction and tested to be certain that they are providing safe water. The Village of Whiting will abandon unused wells (free of charge) for its residents.

SECTION 3.8 PETROLEUM PRODUCT STORAGE TANKS

In the 1990ôs, many of the petroleum product storage tanks in Portage County were removed. Some were found to be leaking and site cleanups were commenced under DNR regulations. Many of the tanks that were removed were not replaced because they were no longer needed. It is estimated that approximately 100 underground tanks have not yet been addressed, although many of them may have been removed and not reported. Those that were replaced have been provided with either double wall construction or leak monitoring systems or both. In addition, the piping between the tanks and the dispensers (gas station or fuel depot) is generally double wall construction. Owners must maintain product records, and tanks are subject to annual inspections.

The Department of Commerce (COMM) maintains a registry of petroleum product tanks still in service, as well as records of properly abandoned tanks. County staff assisted in updating this database,

especially with regard to physical locations of tanks. Formerly the database was organized by property owner address.

Removal of tanks must be supervised by a state certified inspector. Newly installed petroleum product tanks in Portage County require state approval by the inspector from the Village of Plover Fire Department, or the Stevens Point Fire Department (in the City).

Aboveground tanks are routinely installed in secondary containment structures. Secondary containment is required in wellhead protection areas. In the event of a tank leak, the secondary containment will catch the release of the product and prevent it from discharging to the groundwater. Aboveground tanks greater than 60 gallons, and underground tanks greater than 10 gallons, are regulated.

SECTION 3.9 PRIVATE ONSITE WASTEWATER TREATMENT SYSTEMS

In the areas of the County not served by municipal sewerage systems, POWTS have long been used for sewage disposal. Traditional septic systems, whether conventional or mound type systems, if properly designed and maintained, can remove disease causing (pathogenic) bacteria within a few feet of the soil interface. These systems are considerably less effective in removing viruses, organic chemicals, and soluble nutrients such as nitrate nitrogen. Viruses can travel in excess of seven hundred feet, and survive for several months in saturated soils. According to research by Shaw, each person utilizing a POWTS for sewage treatment discharges an average of 10 pounds of nitrate N to groundwater each year. Assuming complete dilution, in order to maintain nitrate N at levels below the health standard of 10 parts per million, a two acre lot is required for a four person family. Given these values, approximately 300,000 pounds of nitrogen would be discharged to the groundwater annually from POWTS in the unsewered areas.

Soil tests to determine the depth to groundwater or bedrock were not required prior to the mid 1970's. Many septic systems were installed without any knowledge of the need for adequate separation (at least 36") between seasonally saturated soil and sewage discharges. While many of these older septic systems have failed and been replaced, it is estimated that nearly fifteen hundred (Figure 3.5) still exist, continuing to discharge disease causing bacteria and viruses in or too close to the groundwater. Some of these systems serve restaurants or other public buildings.

The Department of Commerce adopted revisions to several codes regulating the design, installation, and maintenance of private onsite wastewater treatment systems (POWTS) in the summer of 2000 (See Section 5.1) Generally referred to as the COM-83 package, these revisions allow for several types of POWTS not previously approved for use in Wisconsin. These newer types of systems incorporate pretreatment technology, such as filters and aerobic or anaerobic digesters, and as a result of the pretreatment, can discharge a much cleaner effluent to the environment. These newer systems can be sited on properties (with very shallow bedrock or groundwater) previously suitable for only holding tanks, or for mound systems with variances from State.

In 2000, Portage County placed a moratorium on use of these new technologies within its boundaries. It was one of only a few counties in Wisconsin to do so. **The moratorium allowed municipalities and County staff to study the impacts of allowing rural development in areas formerly considered unsuitable.** This moratorium expired in 2003, allowing property owners to pursue these options. Significant lands (Figure 3.6) could be opened to development, including some with very poor soils for building.

These complex POWTS are more expensive than traditional systems, requiring more maintenance than simple septic tank pumping every two or three years, and requiring more careful design and installation. This consequently increases the plan review and inspection workload of the County Onsite Waste Specialists, and requires even more detailed onsite soil verifications prior to plan review and permit issuance. **If properly sited and maintained, these pretreatment systems will greatly reduce fecal coliform bacteria, biological oxygen demand, and suspended solids in sewage effluent before**

Likely Failing Private Onsite Wastewater Treatment Systems

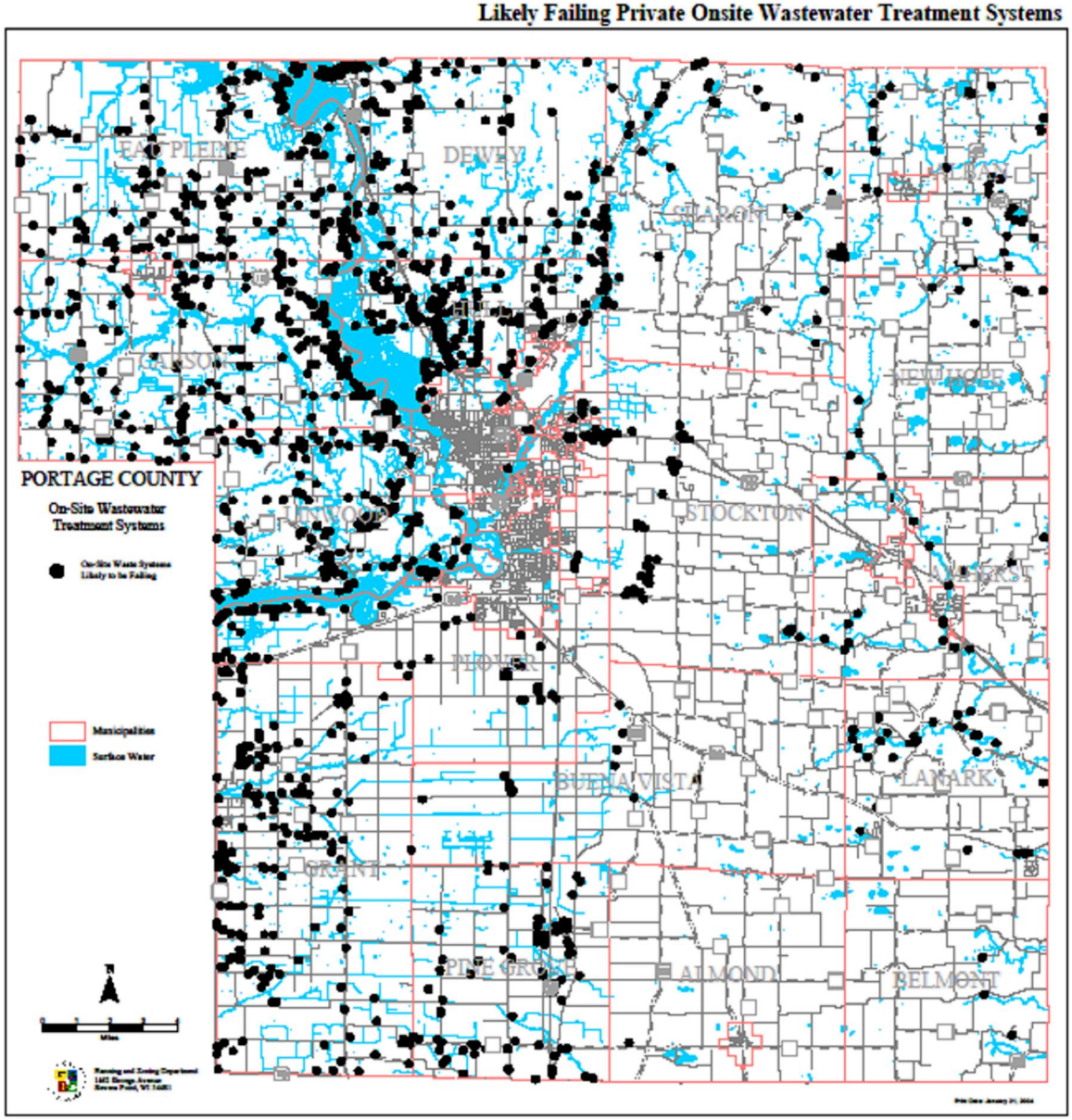


Figure 3.5

Suitable Soils Under COMM 83

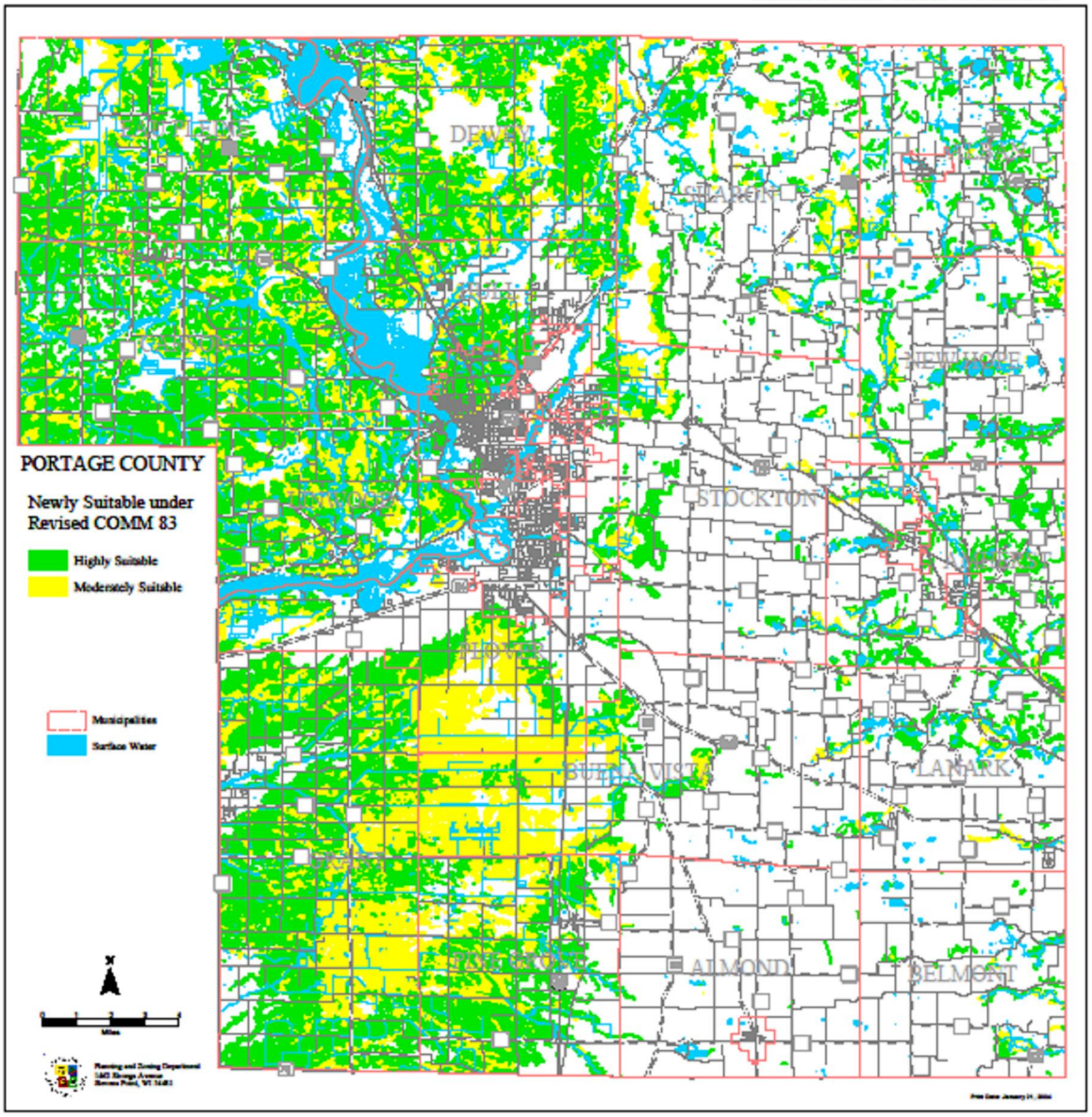


Figure 3.6

discharge to groundwater. Some can even remove nitrate nitrogen, in contrast to more traditional POWTS, which do not. Other potential groundwater contaminants are not significantly attenuated.

The Villages of Nelsonville and Amherst Junction, and the unincorporated areas of Bancroft, Kellner, and Polonia utilize POWTS for sewage treatment. Small lots in these areas result in very close proximities of POWTS and private wells. Contaminant loading to groundwater is significantly more problematic than on larger lots in more rural settings. Private wells are subject to high nitrate levels.

SECTION 3.10 LANDFILLS

Landfills (also formerly known as dumps) have been around as long as people have lived in Portage County. The locations of many of the smaller, private dumps are unknown. The amount of the materials deposited in these was small, and the toxicities of the materials were likely fairly low as compared to current solid waste. The locations (Figure 3.7) of several dozen landfills, including the existing Portage County Landfill and former municipal landfills, are known. All, except the County Landfill, have been closed. Sampling from private wells near these old landfills has not shown widespread deterioration of groundwater, but no systematic sampling has been conducted to date.

Other private landfills in the County are licensed to accept construction demolition waste, or waste from paper processing. In the case of the former, the materials deposited do not have a high potential to leach contaminants to groundwater. For the paper company landfills, extensive testing of the materials, and sampling of nearby monitoring wells, is conducted.

SECTION 3.11 STORAGE AND USE OF ROAD SALT

Because of the winter climate of Portage County, road salting with sodium chloride is, and will probably continue to be, a common activity as long as the public demands snow and ice free roads. Cost effective, safe alternatives do not appear likely in the near future, although significant progress has been made since the first Groundwater Management Plan was published in 1988. High salt concentrations, usually in relation to an uncontrolled point source, can pose a health hazard to some individuals. The public welfare standard for chloride is 250 mg/l, and the preventive action limit is 150 mg/l. Road salt amounting to 8564 tons was used on Portage County roads in the relatively snowy 1985-1986 winter. Currently road salt use is approximately 7000 tons per year.

All salt is supplied through the County Highway Department, except for that used by the City of Stevens Point, and private contractors. The bulk of the salt storage therefore is at two locations in the County; the Stevens Point City Garage and the Portage County Highway Department grounds. Cleanup of City of Stevens Point and Portage County equipment is at sewered facilities.

SECTION 3.12 MUNICIPAL SEWER SYSTEMS

Most of the urban area of the County is served by municipal sewerage services, although several POWTS and sewage holding tanks are located within incorporated municipalities. Municipal sanitary sewers serve the City of Stevens Point, Villages of Park Ridge, Plover, Whiting, Almond, Rosholt, Junction City, and Amherst, as well as a portion of the Town of Plover under a boundary adjustment agreement. The City of Stevens Point provides sewer and water services to the boundary adjustment area of the Town of Plover, with the assurance that the properties in the served area will be annexed to the City within a few years. Park Ridge also contracts with the City of Stevens Point for sewage treatment services. (Figure 3.8)

SECTION 3.13 SEPTAGE

Adequate information is not available to properly identify the fate of much of the septage waste generated in the County. Many of the DNR legal descriptions and approved acreages in Figure 3.3 were inaccurate, and required correction in order to be mapped. If some of the approved sites cannot be

accurately located by legal description, some of the other requirements for landspreading of septage according to NR 113 also may not be met. Minimum distances from houses, wells, and wetlands, could be checked to

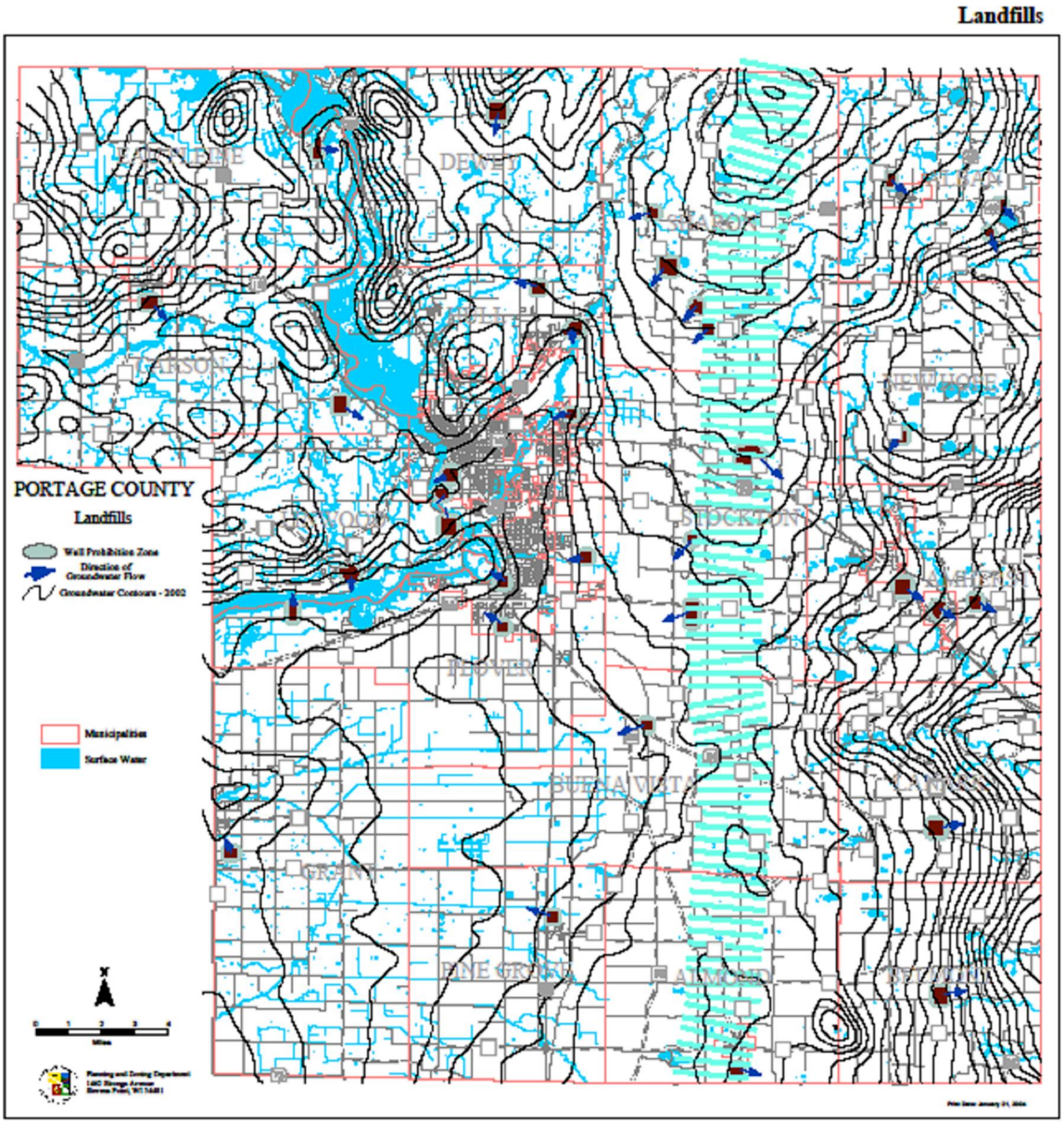


Figure 3.7

Municipal Sewer Service Area

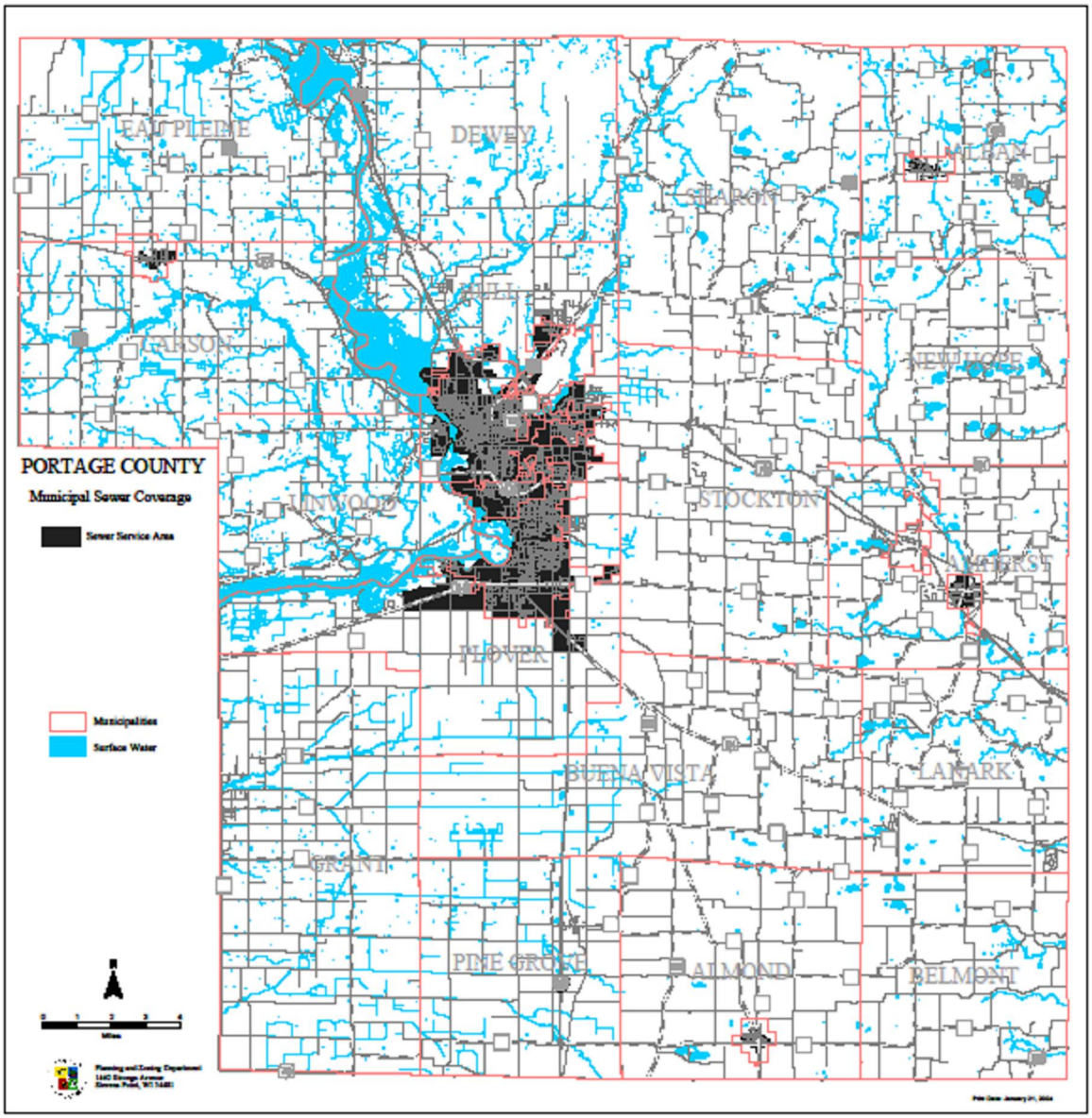


Figure 3.8

verify this presumption. As rural residential land use increases, it is more and more difficult to find proper landspreading treatment sites. A site approval for septage spreading is valid for five years, even if homes and wells are subsequently located within the approved spreading area setbacks.

There are about 200 sewage holding tank systems in Portage County. Assuming 2.6 people per household, and (conservatively) 20 gallons of waste per person per day, approximately 3.8 million gallons of holding tank waste must be disposed of yearly. The sewage treatment plants receive only a very small fraction of this amount.

Septic tank waste, generated in Portage County, is estimated at approximately 3.7 million gallons per year. This estimate is based on a population of about 29000 served by POWTS, 2.6 people per household, an average tank capacity of 1,000 gallons, and a pumping frequency of once every 3 years. These figures do not include septage from commercial or industrial sources.

With the large quantities of septage and holding tank waste generated in Portage County (nearly 8 million gallons annually) and little information on its ultimate fate, landspreading is a serious potential groundwater threat. Portage County may want to consider applying for the authority to regulate septage disposal, if the DNR is found to be performing the task inadequately. The DNR only has one person to monitor a five county area (including Portage) for all landspreading activities.

SECTION 3.14 AGRICULTURAL CHEMICALS ï NITRATE NITROGEN

The drinking water standard (10 parts per million as nitrate-nitrogen) is based on the risk of methemoglobinemia (blue baby disease) to infants. This standard has been unchanged for several decades. Other countries have adopted similar standards. Recent research implicates diarrhea-causing agents, in combination with nitrate nitrogen, in causing methemoglobinemia. Other concerns over health risks associated with nitrate in drinking water have been expressed regarding non-Hodgkins lymphoma, gastric cancer, hypertension, thyroid disorder, birth defects, and miscarriage. Besides human health, concerns about nitrate include toxicity to livestock, fish eggs and fry, amphibian eggs and tadpoles, and the formation of the "Dead Zone" from discharge of nitrogen from the Mississippi River into the Gulf of Mexico.

In some parts of the County, and with some agricultural systems (non-irrigated systems, dairy agriculture, heavier soils), traditional approaches of reducing nitrate loading, by cutting available nitrogen on fields to recommended levels, may substantially improve groundwater. More research is needed.

Based on quantities discharged, nitrate nitrogen leached to groundwater from agricultural operations is the most significant pollutant to Portage County groundwater. Research studies in the 1990ïs by Kraft and others showed that well over ninety percent of groundwater nitrate statewide comes from agriculture. In Portage County, the high percentage of land use in agriculture means that a greater portion of groundwater nitrate (compared with the statewide estimate) comes from agriculture. In some areas of the County, nearly 99% of groundwater nitrate comes from agriculture.

The types of crops grown in some parts of the county, especially under irrigation, result in leaching (to groundwater) of up one third of the nitrogen applied to the crop. Continuing to grow current crops, using established rotations, will continue to increase groundwater nitrate levels. This will happen even if University of Wisconsin recommended Best Management Practices are followed. New strategies will be needed in this industry for improvements to be made.

Already, over 20% of County wells (Figure 4.9) exceed the drinking water standard, including two municipal water systems (Villages of Plover and Whiting), which spend hundreds of thousands of dollars per year to treat their water to remove this contaminant

SECTION 3.15 AGRICULTURAL CHEMICALS ï PESTICIDES

The term pesticides applies to herbicides, fungicides, insecticides, nematocides, and other chemicals intended to kill (unwanted) pest organisms. Very little of the Countyïs agricultural land, irrigated or non-

irrigated, receives no pesticides. Depending on the crop grown, widely varying amounts and mixtures of pesticides are used. Generally, higher value crops receive more pesticides than lower value crops, with soybeans receiving less than a pound per acre, and potatoes receiving about 28 pounds per acre according to the Wisconsin Department of Agriculture (DATCP) in 1997. Irrigated farmland accounts for approximately 40% of all County cropland.

Given available technologies and practices, it is not possible to economically grow some of the current crops without pesticides, although significant efforts are underway in Portage County to apply UW research, and to conduct field tests of biological integrated pest management (Bio IPM). This effort is being coordinated through Tim Connell, UW Extension Agriculture Agent.

Groundwater can be contaminated with pesticides due to improper storage, handling, transport, and use. Storage and handling facilities are regulated and routinely inspected by DATCP staff. Currently, very few farms store pesticides on site, according to Portage County Emergency Management, preferring to obtain the products from the suppliers at the time of application. Many of the suppliers do the actual applications to the crops**. Applicators of restricted use pesticides in agricultural settings are required to be trained and State certified. Records must be kept of locations of applications and amounts applied.**

Not all pesticides are created equal, although the term pesticides itself stirs anxiety in many people. Pesticides posing the greatest threat to groundwater are those with high solubility, toxicity, persistence, and low soil particle attraction qualities. Newer formulations generally have lower potential to reach groundwater, than longer-used chemicals, such as atrazine and aldicarb. Both of these pesticides have been widely detected in Portage County groundwater; in places at levels considered unsafe for human consumption. (Figure 4.8) Although aldicarb has not been used in the County since 1986, and has not been recently detected in private wells, it is still present in groundwater.

Combinations of pesticides can have synergistic, antagonistic, or additive properties. The combined effect of different pesticides has not been addressed in the EPA registration process. When the effectiveness of a pesticide, in combination with other chemicals, is greater than the expected effects of the sum of the individual compounds, it is known as synergism. Antagonism is when the effectiveness of a pesticide, in combination with other chemicals, is less than the anticipated efficacy of the individual compounds. Additive properties are evident when chemicals in combination are no more or less effective than if applied separately.

Recent research by UW Madison Dept. of Zoology Warren Porter has shown evidence of effects on children (hyperactivity and aggression, learning disabilities, and immune function) from very low levels of a mixture of pesticides (including 2,4-D) commonly found around residential lawns and gardens. Similar chemicals are widely applied to cropland in Portage County. Research by Porter and others indicates that mixtures of pesticides, or of pesticides and nitrate nitrogen, are potentially more toxic to humans than individual chemicals. This heightened toxicity may be due to synergistic effects of chemical combinations.

Pesticides in drinking water have been shown to cause a wide variety of health problems for humans, and for non-target organisms in the environment. Due to the mode of action of various pesticides, they can affect human endocrine and immune systems at extremely low levels. Chronic problems can develop at levels much lower than those determined safe in laboratory tests.

SECTION 3.16 LAWN AND GARDEN CHEMICALS

Pesticides are also used around homes, and on turf and gardens. The most commonly used pesticide for these uses is the 2,4-D contained in "weed and feed" lawn fertilizer formulations. Also used around households are malathion, carbaryl, and diazinon, and other chemicals. **No training or certification is required for property owners to purchase and apply these chemicals, nor are records of locations and amounts of applications kept.**

At label application rates, 1.75 pounds of 2,4-D can be applied on a home lawn with two applications permissible per year. Actual usage is generally less. In a survey of two subdivisions with fairly well manicured lawns, only about half of households used a weed and feed formulation on their lawns, and then only once per year (Source: C. Mechenich, 1991)

The split between pesticides applied for agricultural compared to nonagricultural purposes is not precisely known, but it is estimated that about one ten-thousandth of total land applied pesticides used are applied to gardens, lawns and other turf areas. A perspective may be gained by using the following comparison suggested by a Wisconsin Department of Agriculture, Trade, and Consumer Protection official (James Vanden Brook, Groundwater Unit Leader). The herbicide 2,4-D is likely the most commonly used nonagricultural pesticide. In the United States, 16 times more 2,4-D is used in agriculture than on turf). Because 2,4-D makes up only 0.2% of the agricultural pesticides used in Wisconsin, it follows that home and other turf use of 2,4-D is only 1/16 of 0.2% (0.013% or about 1/10,000) of the total agricultural pesticide use. While this analysis is imperfect (it neglects other, less commonly used pesticides), it demonstrates relative magnitudes of pesticide use.

Data regarding fertilizer applications to lawns and gardens in Portage County is unavailable. It has been suggested that, on a per acre basis, higher levels of pesticides and fertilizers are applied on lawns and gardens than on cultivated cropland. This could be a significant groundwater concern in areas of concentrated residential and commercial development, and should be the subject of a future groundwater management effort in affected parts of Portage County.

SECTION 4.0 THE COUNTY'S GROUNDWATER RESOURCES

SECTION 4.1 INTRODUCTION

The citizens of Portage County are highly dependent on groundwater for drinking, municipal, industrial, agricultural, and other uses. So too are the County's streams, lakes, wetlands, and aquatic plant and animal communities. Our groundwater is owned by all of us in a public trust. Along with the rights of ownership go the responsibilities for stewardship, and for passing the resource on to future generations. Three critical groundwater challenges have been identified by the Groundwater Citizens Advisory Committee (GCAC) - groundwater quantity, nitrate pollution, and pesticide pollution ï as priorities for future action. The GCAC has also suggested goals and some strategies to address these challenges.

Groundwater quantity conflicts arise when pumping lowers the water table so that all users are unable to get sufficient water for their needs, and when pumping diverts water away from streams, lakes, and wetlands. A critical groundwater quantity concern exists in the Little Plover River basin, where groundwater use may be leading to the demise of the stream and its native brook trout fishery. A goal and strategies have been developed to meet this specific concern, and to identify other severely limited groundwater problem areas.

Nitate pollution affects much of Portage County's groundwater and most of its wells. About 20% of County wells exceed the standard. A variety of human health concerns regarding nitrate exist, as well as concerns about toxicity to aquatic wildlife. Nitrate concentrations in Portage County groundwater have been increasing for about 30 years, and the increase continues. Reducing nitrate pollution will require tackling agricultural sources, which are responsible for perhaps 95% of nitrate pollution.

Pesticide pollution also affects large numbers of County wells. Atrazine is the largest problem, occurring in 40% of wells. About 3% of wells have been estimated to exceed the atrazine health standard, but this is likely an underestimate caused by a faulty interpretation of the analytical method. Other pesticides are also likely present in groundwater. More information is needed on what pesticides are used in the County, and which pesticide residues leach to groundwater. Further, better information is needed on the toxicology data that exist for these compounds and where toxicology data are lacking.

SECTION 4.2 GROUNDWATER QUANTITY

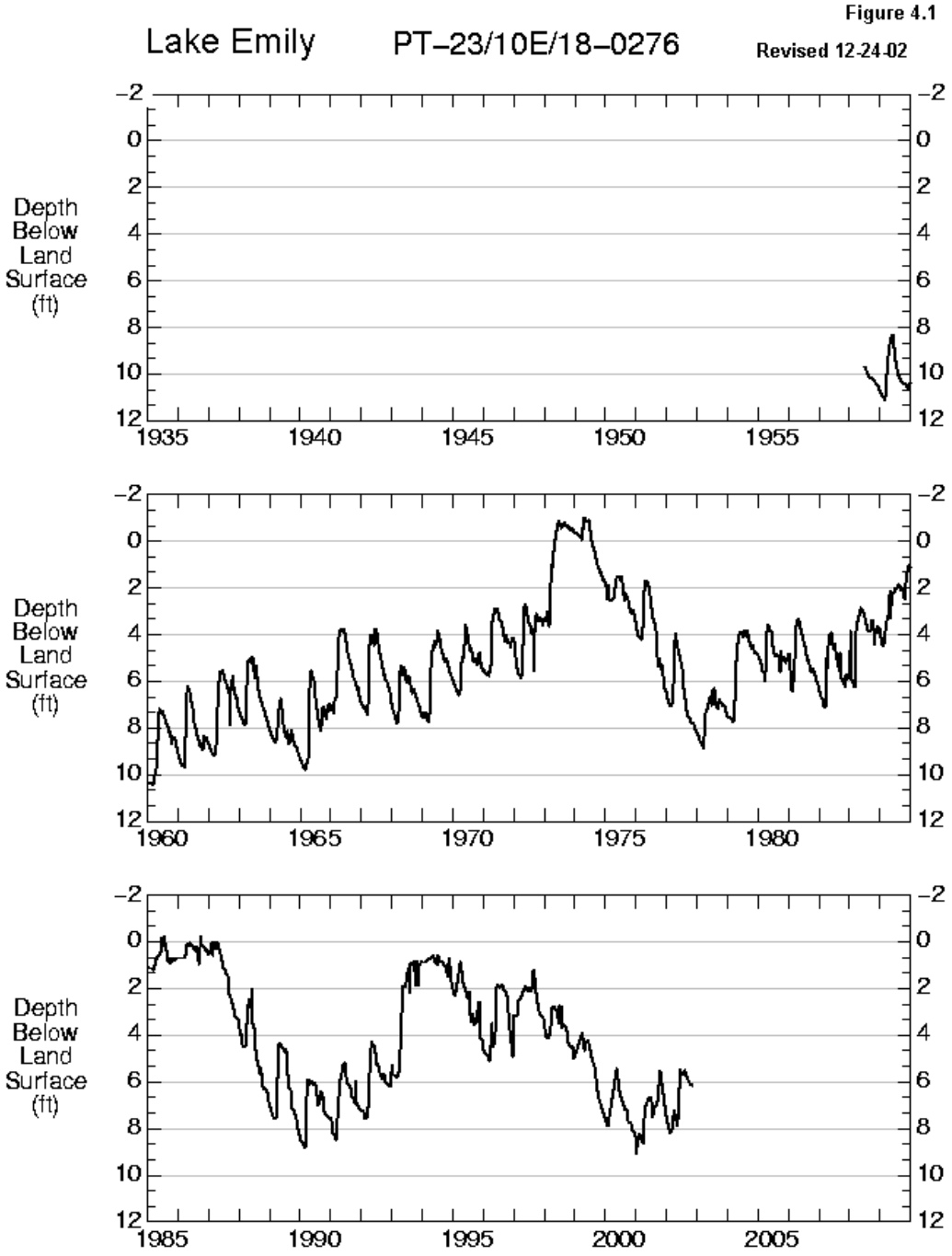
Groundwater quantity was never given much attention in Portage County. The presence of practically unlimited groundwater, a few feet below the surface in the sand plain, easily accessible to anyone who wanted it, allowed us to take this precious resource for granted. It also allowed the development of the irrigated agricultural industry that is such a large part of Portage County's economy and culture.

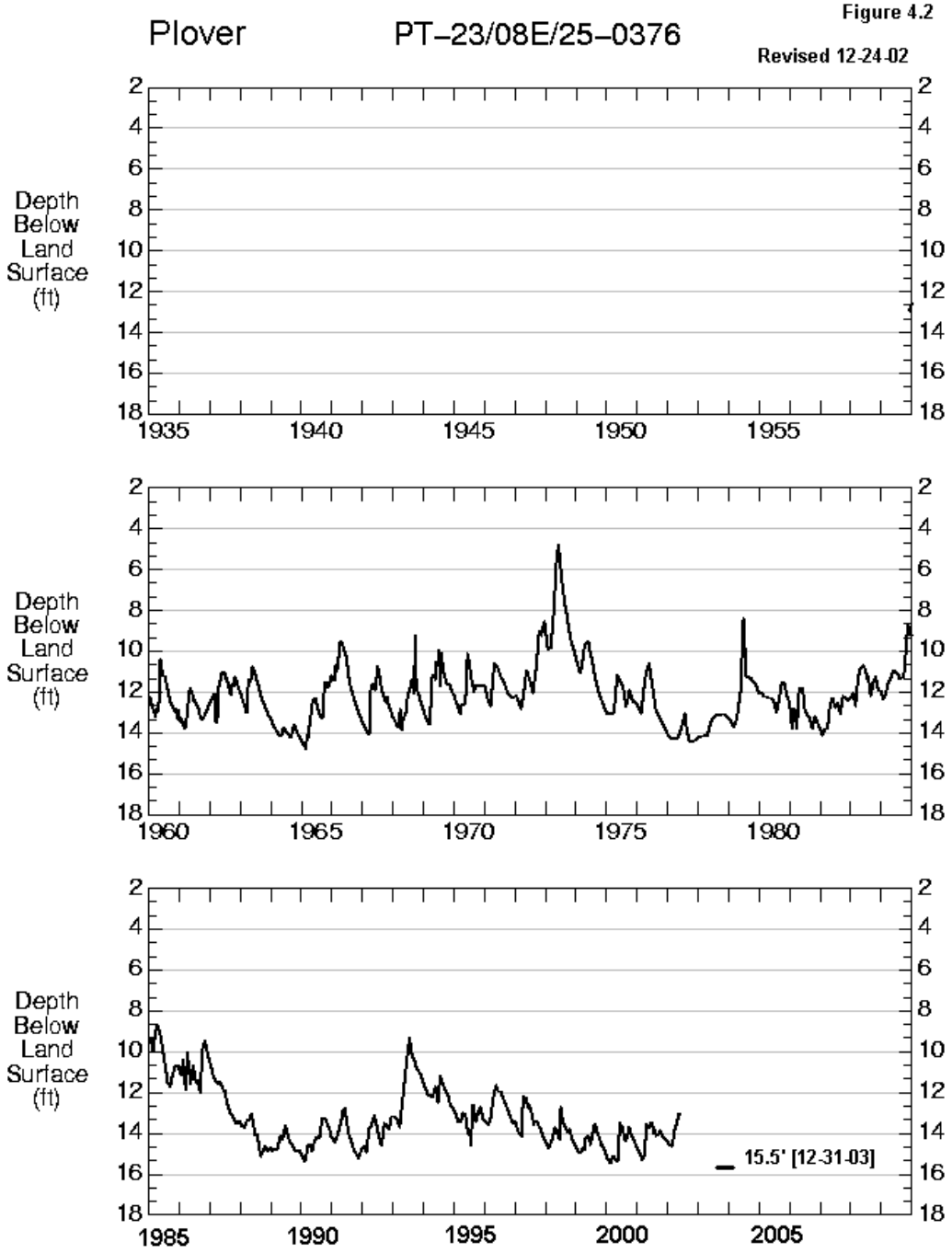
In most areas of the County, sufficient groundwater exists to serve the needs of most citizens. In bedrock wells in the northwestern part of the County, low flows can severely limit available quantities of water. This is especially challenging for municipalities, such as Junction City, and agricultural operators located in this area.

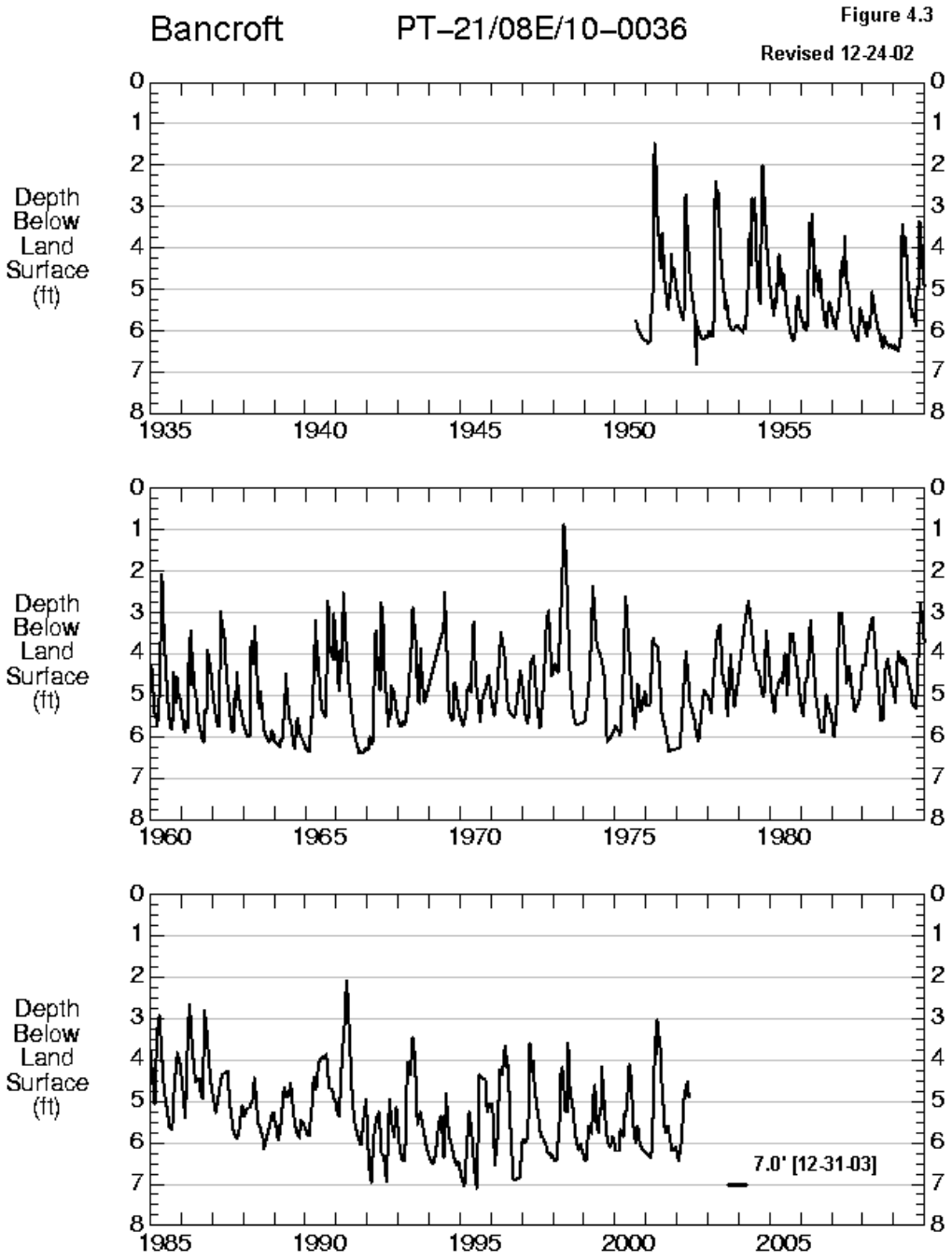
In areas where high volume users, such as municipalities, industries, and irrigated agriculture, all draw significant quantities of groundwater, they affect each other and the natural environment. This has been observed over the past couple of decades in the Little Plover River basin.

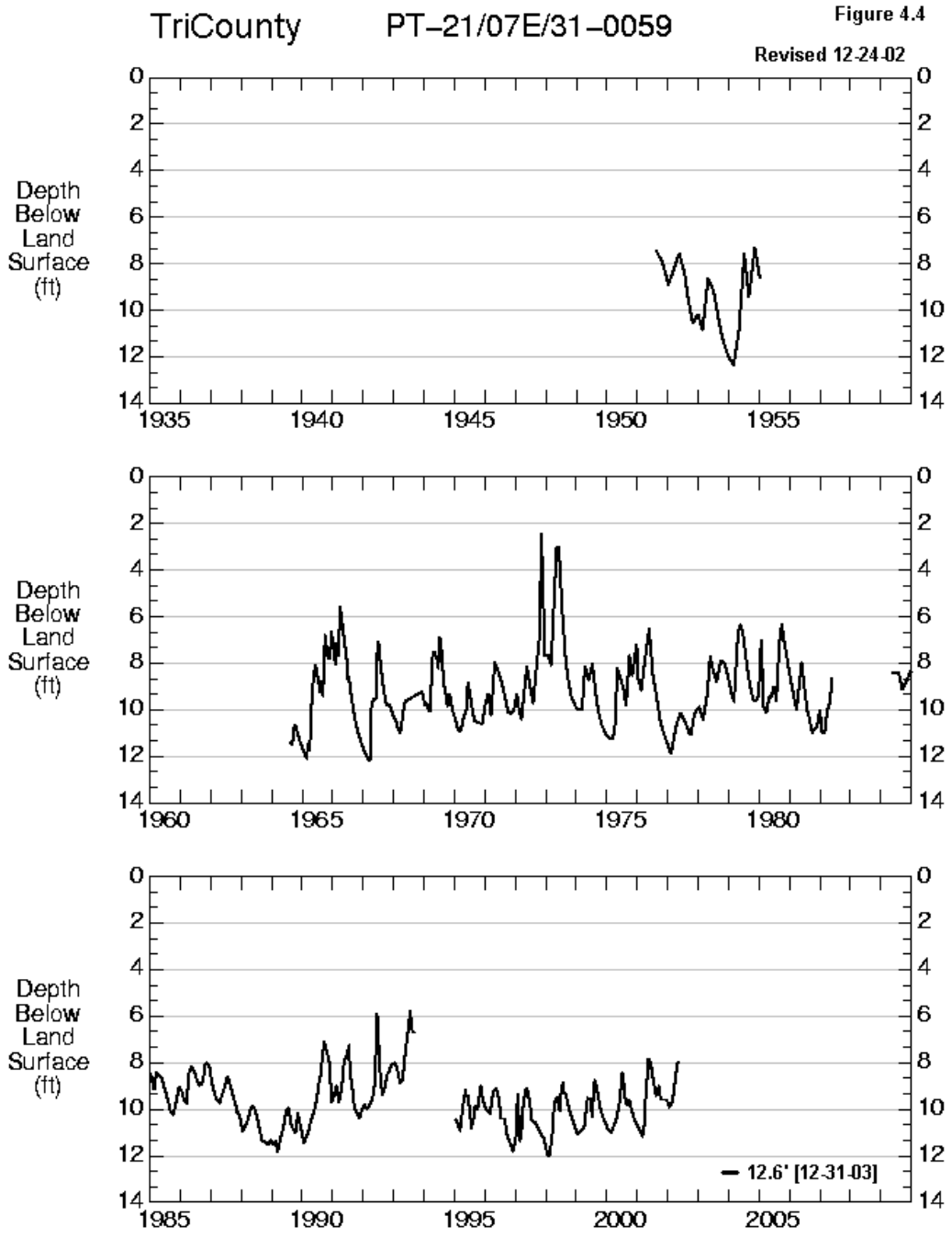
Issues to be considered when looking at groundwater quantity concerns are the natural climatic cycles, and the needs of humans and the environment. According to water level measurements taken since the 1950's, we are able to see fluctuations in normal water table levels of approximately ten feet on a

recurring basis, and of annual fluctuations of about five feet. (See Figures 4.1 through 4.4) Long time residents of the area around Lake Emily will no doubt recognize the groundwater level variations which




Plover
PT–23/08E/25–0376
Figure 4.2
Revised 12-24-02
Depth Below Land Surface (ft)
2
4
6
8
10
12
14
16
18
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
15.5' [12-31-03]


Bancroft
PT–21/08E/10–0036
Figure 4.3
Revised 12-24-02
Depth Below Land Surface (ft)
0
1
2
3
4
5
6
7
8
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
7.0' [12-31-03]


TriCounty
PT–21/07E/31–0059
Figure 4.4
Revised 12-24-02
Depth Below Land Surface (ft)
0
2
4
6
8
10
12
14
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
12.6' [12-31-03]

correspond with lake level changes. Current groundwater levels in these monitoring wells are the lowest since measuring began. It is primarily during times of low water tables, associated with lower annual precipitation, that the greatest demands are placed on our groundwater for municipal and irrigation uses.

A distinction needs to be drawn between the amount of water pumped out of the ground and the amount actually removed from its natural discharge area. Groundwater pumped from private wells is usually returned to the aquifer after treatment in a POWTS. Only a negligible amount is lost.

However, considering the water pumped for irrigation, industrial, and municipal uses, a good deal of the water is "consumed" rather than returning to its natural discharge zone. For agricultural irrigation, the net effect is that groundwater recharge is reduced about 30 to 40% on each irrigated acre, which reduces discharge to lakes and streams by an equal amount. Pumping for industrial and municipal purposes can have a greater influence because most of this pumping is concentrated in small areas, and groundwater pumped for this purpose is frequently diverted away from the streams where the groundwater would naturally want to discharge. The same would be true for a bottled water or beverage bottling facility. The groundwater is ñminedò and none is returned to the aquifer.

For example, the City of Stevens Point pumps water from the Plover River basin (amounting to about 10% of the riverôs flow), circulates it through the City, and discharges the water to the Wisconsin River. Similarly, the Village of Plover wells take groundwater from the Little Plover Basin, and discharges it to the Wisconsin River. Groundwater models have shown that flows in the Little Plover could diminish by over 40%, when the well pumping reaches design capacity. This 40%, added to the 10% or so reduction from irrigation, could mean the demise of the Little Plover as a native brook trout fishery. This effect on the Little Plover River may be ameliorated by pumping more of the Villageôs water from the new well sited south of Lake Pacawa.

By far, the most concentrated withdrawal of groundwater in the County is in the Village of Whiting, where a high density of municipal and industrial wells is located. This wellfield likely has some, though probably small, influence on surface water. Monitoring wells in the vicinity of this wellfield have shown some declines in water levels.

In 2002, the City of Wisconsin Rapids announced plans to study installation of a municipal well in the Town of Grant in Portage County. Town of Grant residents were concerned about the effects that ñminingò the groundwater would have on their private wells and the natural environment. Irrigation well owners and cranberry growers were concerned about declining water levels for their crops. It was determined that under current Wisconsin Statutes, the Town and County can have very little influence over where a municipal well is located, even one exporting groundwater to a municipality in another county.

The Portage County Board, in response to a request by the GCAC, passed a resolution (Appendix HC) opposing any withdrawal of water from the County without a full hydrogeological study of likely impacts, and requesting that the Wisconsin State Legislature enact legislation allowing counties to regulate such removals of groundwater from the County. Draft groundwater quantity legislation is currently being studied by Legislative committees and working groups.

Table 4.1 Pesticides Used in Portage County

Common Name	Trade Name	Use	Water sol (mg/l)	Soil Persist Half-life (days)	Leaching Potential	Koc	Toxicity LD50 Rat (mg/kg) FCH/TPB	Signal Word (Table xx)	Level	Family
Dibromochloropropane	DBCP/Nemagon	Fm	1000	180	Large	70	300/170	Warning	2	Halogenated organic
Ethylene dibromide	EDB	Fm					146	Danger	1	Halogenated organic
Metam-sodium	Vapam/Busan	Fm	963000	7	Medium	10	820/1800	Caution	3	Dithiocarbamate
Propamocarb hydroch.	Banol	Fg	1005000				8550/2000	Caution	4	Carbamate
Mancozeb	Permcozeb/Dithane	Fg	6	70	Small	2000	11200/>8000	Caution	4	Dithiocarbamate
Maneb	Manex	Fg	6	70	Small	2000	7990/6750	Caution	4	Dithiocarbamate
Basic Copper sulfate	KOP 300	Fg	Insoluble					Warning	2	Inorganic copper compound
Copper hydroxide	Champ/Champion	Fg	Insoluble	*	*	*	1000	Danger	1	Inorganic copper compound
Triphenyltin hydroxide	Super Tin/Du-Ter	Fg	1	76	Small	23000	156/108	Warning	2	Organotin
Metalaxyl	Ridomil	Fg	8400	70	Large	50	669	Caution	3	Phenylamide
Chlorothalonil	Bravo	Fg	0.6	30	Small	1380	>10000	Danger	1	Substituted aromatic
Alachlor	Lasso/Bullet	H	240	15	Medium	170	1350/930	Caution	3	Acetanilide
Metolachlor	Dual	H	530	90	Large	200	2780	Caution	3	Acetanilide
Acetochlor	Harness	H	23-223	*	*	*	1700/2953	Warning	2	Acetanilides
Chloramben	Amiben	H	900000	14	Large	15	5620	Caution	3	Benzoic acid
Dicamba	Banvel/Clarity	H	400000	14	Large	2	2629/1700	Warning	2	Benzoic acid
Bentazon	Basagran	H	2300000	20	Large	34	2063/1100	Caution	3	Bezothiadiazole
Diquat dibromide	Diquat Herbicide	H	718000	1000	Small	100000	215-235/231	Warning	2	Bipyridylium
Paraquat	Total/Gramoxone	H	620000	1000	Small	100000	150	Danger	1	Bipyridylium
2,4-D Acid		H	890	10	Medium	20	699/375	Caution	3	Chlorinated Phenoxy Acid
2,4-D Amine	Butyrac 200/Formula 40	H	796000	10	Medium	20	500-805	Danger	1	Chlorinated Phenoxy Acid
2,4-D Ester	Crossbow/Shotgun	H	100	10	Medium	100	700	Caution	3	Chlorinated Phenoxy Acid
MCPA dimethylamine	MCPA	H	866000	25	Large	20	1160	Danger	1	Chlorinated Phenoxy Acid
MCPA ester	MCPA	H	5	25	Small	1000	1160	Danger	1	Chlorinated Phenoxy Acid
Dimethenamid	Guardsman/Frontier	H	1174	20	*	155	1293/1570	Caution	3	Chloroacetamide
Sethoxydim	Poast/Vantage	H	4390	5	Small	100	3500/3200	Caution	4	Cyclohexenone
Pendimethalin	Prowl	H	0.275	90	Small	5000	3956/1050	Caution	3	Dinitroaniline
Trifluralin	Treflan	H	0.3	60	Small	8000	>10000	Varies	1-3	Dinitroaniline
Maleic hydrazide (K salt)	Retard	H	400000	30	Large	20	6950	Caution	4	Hydrazide
Linuron	Lorox/Linex	H	75	60	Medium	400	4000	Caution	3	Phenylurea
Glyphosate	Roundup	H	900000	47	Small	24000	>5000/5600	Warning	2	Phosphono Amino Acid
Chlorthal-dimethyl/DCPA	Dacthal	H	0.5	100	Small	5000	>10000/>3000	Caution	4	Phtalic acid
Endothall	Des-I-cate/Endothal	H	100000	7	Medium	20	51	Warning	2	Phtalic acid
Nicosulfuron	Accent	H	22000	21	Large	30	>5000	Caution	4	Sulfonylurea

Common Name	Trade Name	Use	Water sol (mg/l)	Soil Persist Half-life (days)	Leaching Potential	Koc	Toxicity LD50 Rat (mg/kg) FCH/TPB	Signal Word (Table xx)	Level	Family
Primisulfuron-methyl	Beacon	H	70	30	Large	50	>5050	Caution	4	Sulfonylurea
Butylate	Sutan	H	44	13	Small	400	5431/3500	Caution	3	Thiocarbamate
EPTC	Eptam	H	344	6	Small	200	1630/1367	Caution	3	Thiocarbamate
EPTC & Safener	Eradicane	H	344	6	Small	200	2000-2870/1367	Caution	3	Thiocarbamate
Atrazine	Aatrex/Bullet	H	33	60	Large	100	1780/1869	Caution	3	Triazine
Cyanazine	Bladex	H	170	14	Medium	190	288	Warning	2	Triazine
Metribuzin	Sencor	H	1220	40	Large	60	2000/2200	Caution	3	Triazine
Simazine	Princep	H	6.2	60	Large	130	>5000	Caution	4	Triazine
Aldicarb	Temik	I	6000	30	Large	30	5/0.9	Danger	1	Carbamate
Carbaryl	Sevin	I	120	10	Small	300	246-283/307	Warning	2	Carbamate
Carbofuran	Furadan	I	351	50	Large	22	8	Danger	1	Carbamate
Methomyl	Lannate	I	58000	30	Large	72	24/17	Danger	1	Carbamate
Oxamyl	Vydate	I	282000	4	Small	25	5.4/5	Danger	1	Carbamate
Endosulfan	Thiodan	I	0.32	50	Small	12400	23-160/18	Danger	1	Cyclodiene
Cryolite	Kryocide	I	420	3000	Small	10000	>10000	Caution	3	Inorganic fluorine compound
I Isofenphos	Amaze	I	24	150	Medium	600	20/32	Danger	1	Phenyl Organophosphate
Methamidophos	Monitor	I	1000000	6	Medium	5	16-21/13	Danger	1	Phosphoramidothioate
Azinphos-methyl	Carfene/Guthion	I	29	10	Small	1000	04/05	Danger	1	Phosphorodithioate
Chlorpyrifos	Lorsban	I	0.4	30	Small	6070	96-270/135	Warning	2	Phosphorodithioate
Dimethoate	Cygon	I	39800	7	Medium	20	235/250	Warning	2	Phosphorodithioate
Disulfoton	Disyston	I	25	30	Small	600	12/02	Danger	1	Phosphorodithioate
Fonofos	Dyfonate	I	16.9	40	Small	870	17.5/8	Danger	1	Phosphorodithioate
Malathion	Cythion	I	130	1	Small	1800	5500/885	Caution	3	Phosphorodithioate
Phorate	Thimet	I	22	60	Small	1000	2-4/1.6	Danger	1	Phosphorodithioate
Terbufos	Counter	I	5	5	Small	500	4.5-9/1.6	Danger	1	Phosphorodithioate
Diazonon	Spectracide	I	60	40	Small	1000	1250/300	War-Cau	2	Phosphorothioate
Fensulfothion	Terracur P	I	Barely				05/02	Danger	1	Phosphorothioate
Esfenvalerate	Asana	I	0.002	35	Small	5300	458/75	Warning	2	Synthetic Pyrethroid
Fenvalerate	Belmark/Sumicidin	I	0.002	35	Small	5300	451	Warning	2	Synthetic Pyrethroid
Permethrin	Ambush/Pounce	I	0.006	30	Xsmall	100000	430-4000/>4000	Warning	2	Synthetic Pyrethroid
Piperonyl butoxide	Pybuthrin	Syn					>7500	Caution	4	Synergist for Pyretrhrins & others

Use : Fm = fumigant, Fg = fungicide, H = herbicide, I = insecticide

Koc : Measure of soil attraction; higher number = higher soil attraction

Sources: Water solubility, Persistence, Leaching potential, and Koc from Water Quality and Quantity Index ,USDA-NRCS
Toxicity Level and Signal Word, from Farm Chemicals Handbook 2000 (FCH)
Toxicity Level and Family from The Pesticide Book (TPB)

SECTION 4.3 GROUNDWATER QUALITY

When discussing groundwater quality, it is important to understand the differences between natural groundwater quality (which we can do little about except educate ourselves), individual well problems (which we may be able to do something about as water users), and groundwater pollution from human activities and land uses (which we have an obligation to address). Most of the following information will concentrate on the human activities and land uses, although current and proposed County groundwater programs also address health concerns related to the first two.

4.3.1 Natural Groundwater Quality Concerns

The natural groundwater quality of Portage County is generally good. Where natural water quality problems exist, they include iron, manganese, radionuclides, and corrosive water. Arsenic is not a concern here.

Iron and manganese are two metals that occur naturally in the sediments and bedrock that make up the County's aquifers. Both are essential to life, but become a nuisance when they are present in water at too high a concentration. This happens under certain chemical conditions when oxygen in the groundwater becomes depleted, and the iron and manganese in aquifer materials undergo a chemical change that makes them soluble in groundwater. The main concern with iron and manganese is not health, but rather taste, odor, and staining of plumbing fixtures and laundry. The US Environmental Protection Agency set a drinking water standard based on aesthetic (not health) concerns of 0.3 parts per million for iron and 0.05 ppm for manganese. Iron and manganese tend to be more of a problem in the shallow rock and marsh provinces, or in sand and gravel wells screened near bedrock. Individual treatment units, and installing a well into a different part of the aquifer, are routinely used to deal with these contaminants. Iron and manganese are found throughout the County, but nuisance levels are most severe in southwestern and western Portage County.

Radionuclides are elements that undergo nuclear decay. Nuclear decay is the process by which atoms split to form other atoms, and in the process emit potentially harmful radiation. A number of radioactive elements - radium, radon, uranium, thorium, and others - occur in the bedrock aquifer, particularly at greater depths. The USEPA is in the process of revising standards for radioactivity in drinking water for public water supplies. The current standards are: "combined radium 226/228 of 5 pCi/L (picocuries per liter); a combined standard of 4 millirems for beta emitters; and a gross alpha standard for all alphas of 15 pCi/1, not including radon and uranium" (http://www.epa.gov/ogwdw000/standard/radionuc.html). We do not know the number of wells in Portage County with exceedances of radioactivity standards, but radon from well water is a significant contributor of residential radon levels. Radon, when inhaled, is known to contribute to lung cancer, particularly in combination with tobacco smoke.

Since bedrock wells are more common in the northwest part of the County, this is likely where the greatest radioactivity concerns exist. Over 2,000 Portage County wells terminate in the bedrock aquifer (see Figure 4.5). Only a few have been tested for radionuclides. Significant levels of groundwater radioactivity east of Stevens Point have resulted in abandonment of several wells.

Studies by DNR in areas of granite wells have shown dangerous levels of radionuclides in a significant percentage of these wells. Unfortunately, no widespread sampling of bedrock wells, similar to that conducted for atrazine in the mid-90's, has been conducted in Portage County.

Corrosive water is a term used for naturally soft and acidic water. The water itself is not harmful; however, its chemistry is right for dissolving metal in plumbing. This results in damage to plumbing (e.g., leaks in copper pipe), but more importantly, dissolved copper and lead in drinking water can cause severe health problems, ranging from indigestion and headaches, to brain and liver damage, especially in children. Dissolved lead is more of a problem in older homes (pre-1984) when lead solder was commonly

Naturally Occurring Radioactivity in Bedrock Wells

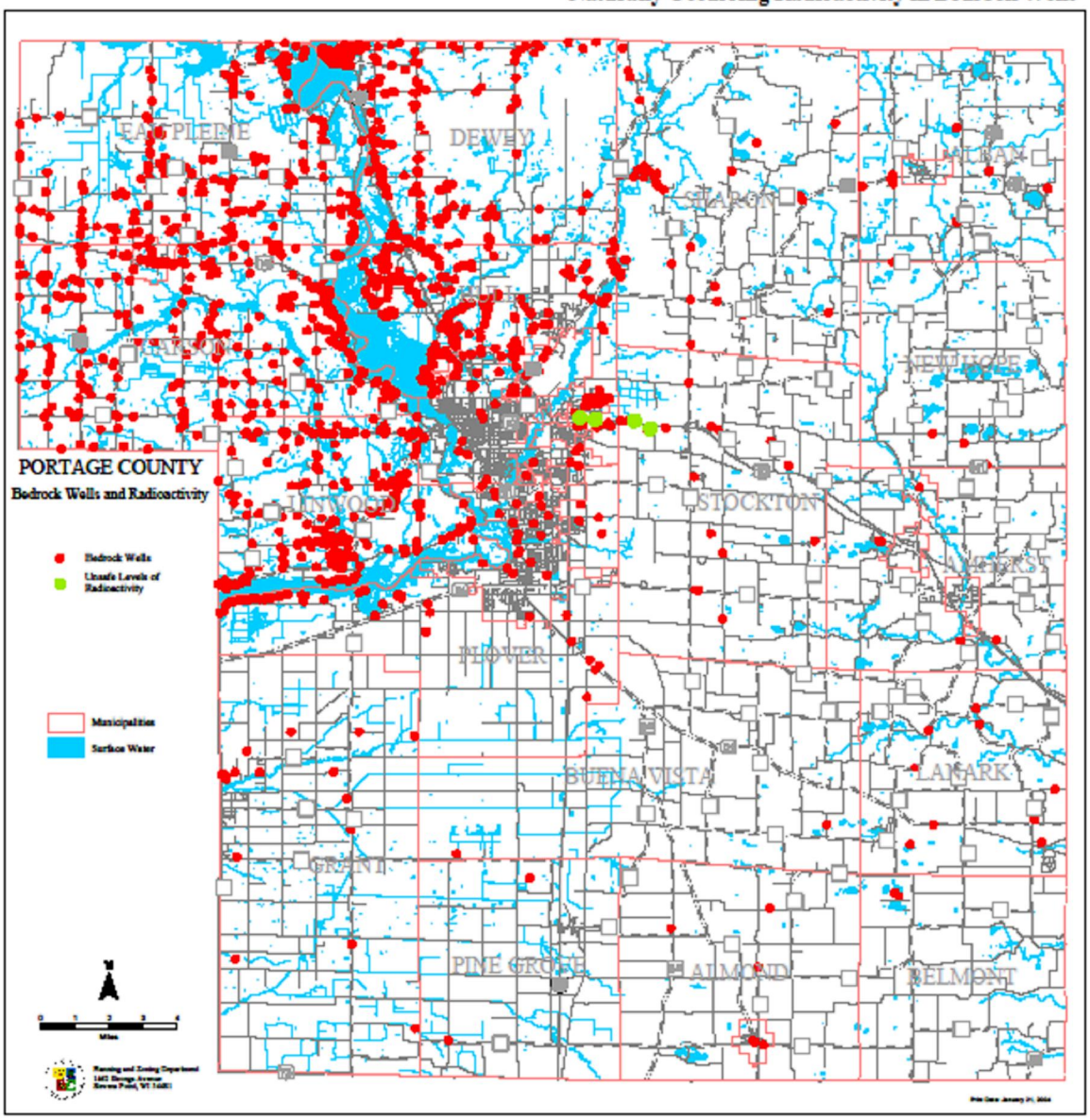


Figure 4.5

used, but dissolved copper is a problem in homes that have copper pipes. Corrosive water is most common in the southwestern part of the County (Figure 4.6).

Microorganisms (bacteria, viruses, and others) occur naturally in the environment, including in aquifers and groundwater. Most are harmless or even beneficial, but some can cause disease, and others create nuisance conditions. Coliform bacteria and fecal coliform bacteria are frequently analyzed in well water samples. Coliform bacteria are a broad group that have members who live in soil, water, vegetation, and in the gut of animals. Fecal coliform bacteria are members of the group who specifically live in the gut or in feces. Most members of the coliform group do not cause disease; however, they are good indicators that a breach exists in the sanitary condition of a water system. In Portage County, coliform bacteria are usually not present as a groundwater contaminant, but rather, enter wells via a defect (missing well cap, cracked casing, and poor well construction) or move through groundwater from a substandard septic system into a shallow well. Following well reconstruction or repair, disinfection can usually eliminate bacterial contamination.

Unused wells (see Figure 3.6) that have not been properly abandoned provide ideal routes for bacteria to enter nearby wells, since contaminants can move directly from the surface to groundwater. One of the proposed strategies will address this problem. Even following abandonment of an unused well, nearby wells may be test unsafe for an extended period of time (months), and will probably not respond well to disinfection.

Metals (other than those naturally occurring or corrosivity-related) that are of concern from a drinking water and groundwater perspective, include arsenic, lead, cadmium, mercury, and others. When found in groundwater, these would most likely be found in association with landfills, or electroplating and other industrial sites. Metals pollution of groundwater is rarely widespread. No instances of metals pollution of groundwater, at levels of concern, have been documented in Portage County.

4.3.2 Human Induced Groundwater Quality Concerns

Petroleum-related Organic Pollutants

Common pollutants in this category (excluding pesticides) include benzene, toluene, dichlorethane, trichloroethylene, xylene, and others. Instances of this type pollution are relatively rare, usually cover small areas, and frequently are related to accidental discharges. Most are due to old spills around gas stations, dry cleaners, industrial sites, and pipelines, and may be present near current salvage yards. About 40 wells in the County are believed to contain these pollutants. Most contaminated sites have been addressed by the property owner (with assistance from DNR and PECFA) or have low enough contaminant levels to be candidates for natural attenuation. Excavated soils (from contaminated sites) containing low levels of these contaminants are generally landspread to allow the soil to provide final treatment. According to an analysis done using the County GIS, only an area of cropland in Pine Grove meets the State code criteria for landspreading of petroleum contaminated soils. No sites have been approved in the County for this type of land application.

In addition to these known point sources of contamination, organic chemicals from cleaning and other household chemicals are routinely discharged to groundwater through private onsite wastewater treatment systems (POWTS). Some POWTS, which incorporate pretreatment, will do a better job of treating for these contaminants than standard systems. These contaminants are also present in stormwater runoff from roads, parking lots, and other paved surfaces. Stormwater must be adequately treated by discharging to properly constructed retention-infiltration basins. Percolation of stormwater through topsoil lined basins will trap these organic contaminants, as well as some others that may be present. Discharge of stormwater to drywells or unlined basins, will allow these contaminants to be flushed into our groundwater.

Known Areas of Naturally Corrosive Water

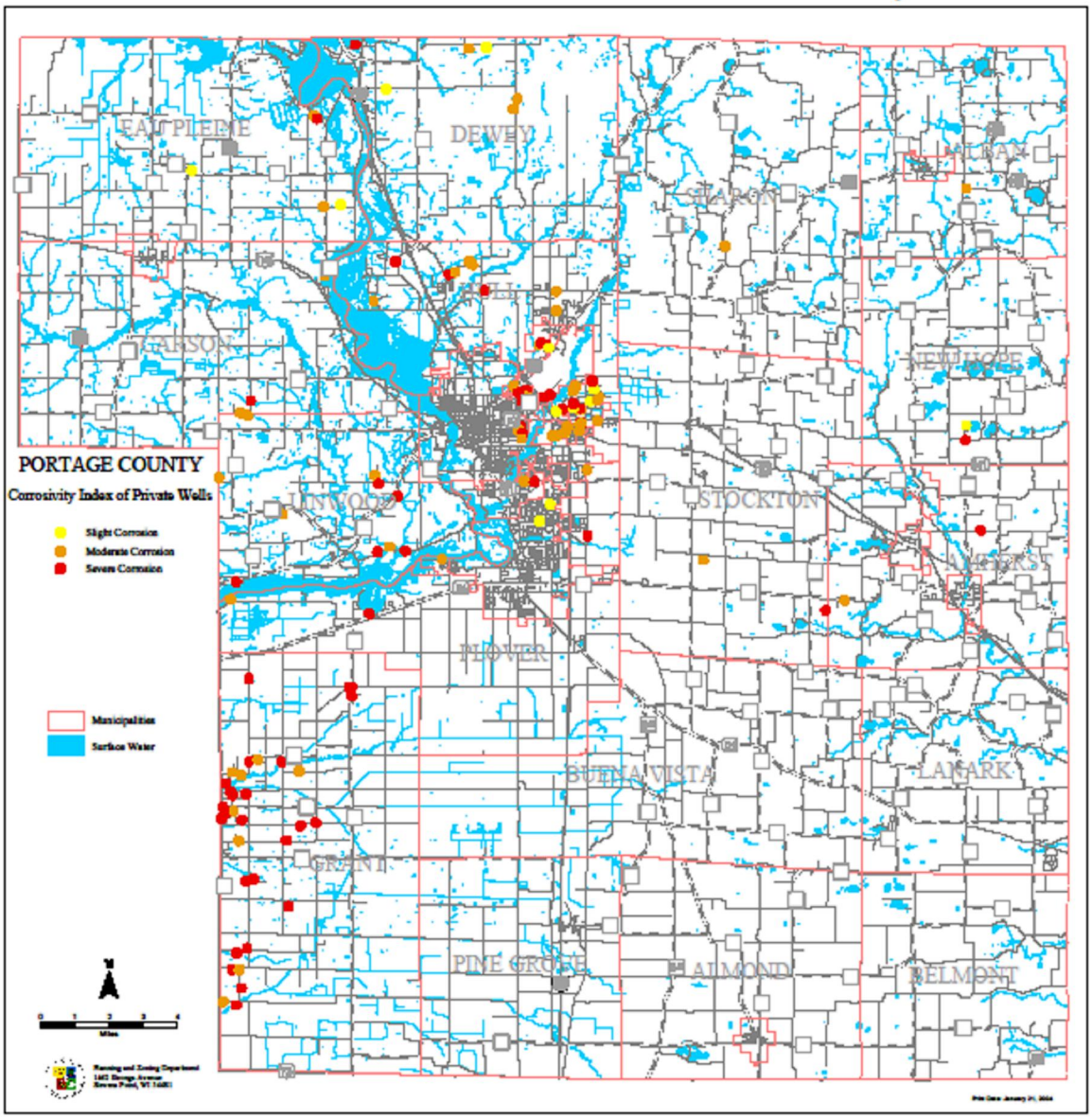


Figure 4.6

Chlorides

In areas of runoff from paved surfaces (parking lots and highways), chlorides can be found at significant levels. A high percentage of chloride passes into the groundwater since it is not significantly attenuated during infiltration. Chlorides can be an indicator of contamination from septic systems, road salt, or animal waste and fertilizers.

Pesticides

The term "pesticide" includes herbicides, insecticides, nematocides, fungicides, and other compounds used to control organisms. Over 90 different pesticide products were reported as being used in Wisconsin in 1996. About two thirds of these have been reportedly used in Portage County. (See Table 4.1) Pesticide application rates vary substantially among crops; averaging about 0.8 pounds (as active ingredient) per acre for soybeans, 2 to 3 pounds per acre for field corn, and around 28 pounds per acre on potatoes. Source: Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) 1997.

Pesticides are also used around homes - on lawns and gardens. The most commonly used pesticide around households is the 2,4-D contained in "weed and feed" lawn fertilizer formulations. Also used around households are malathion, carbaryl, and diazinon. At label application rates, 1.75 pounds of 2,4-D can be applied on a home lawn with two applications permissible per year. Actual usage is less. In a survey of two subdivisions with fairly well manicured lawns, only about half of households used a weed and feed formulation on their lawns, and then only once per year

The split between pesticides applied for agricultural compared to nonagricultural purposes is not precisely known, but a perspective may be gained by using the following comparison suggested by a DATCP official (James Vanden Brook, Groundwater Unit Leader) The herbicide 2,4-D is likely the most commonly used, nonagricultural pesticide. In the US, 16 times more 2,4-D is used in agriculture than on turf. Because 2,4-D makes up only 0.2% of the agricultural pesticides used in Wisconsin, it follows that home and other turf use of 2,4-D is only 1/16 of 0.2% (0.013% or about 1/10,000) of the total agricultural pesticide use. While this analysis is imperfect, and neglects other less commonly used household pesticides, it demonstrates relative magnitudes of pesticide use.

Data is currently unavailable to determine the amounts of specific pesticide residues ("residues" means the parent pesticide, plus its related breakdown products) present in Portage County groundwater. With the exception of atrazine and aldicarb, very few wells have been sampled for many of the pesticides that can be expected to leach to groundwater. It is reasonable to expect, based on widespread detection of residues of soluble pesticides such as atrazine, alachlor, and aldicarb, that other leachable pesticides have been reaching groundwater where they have been used.

Atrazine **is the largest known pesticide problem,** having been detected in over 40% of Portage County wells. About 3% of wells are known to exceed the health standard of 3.0 parts per billion. This has led to the establishment of several atrazine moratorium areas (Figure 4.5) in the County, where atrazine cannot presently be used. More wells, in which atrazine has been detected, may exceed the atrazine standard. A problem exists that most wells are tested for atrazine using a "triazine screen". This test, though significantly less expensive than the gas chromatograph analysis used for regulatory testing, consistently underestimates the true amount of atrazine residues present in groundwater. It is estimated that over 20% of wells, testing below 1 part per billion on the triazine screen, in reality exceed the groundwater standard of 3 parts per billion. Follow-up gas chromatograph analyses have been provided, by CIBA GEIGY and NOVARTIS (through DNR) in the past, for triazine screen results above 1.0 ppb in Portage County.

Pesticides (Other than Atrazine) Detected in Private Wells

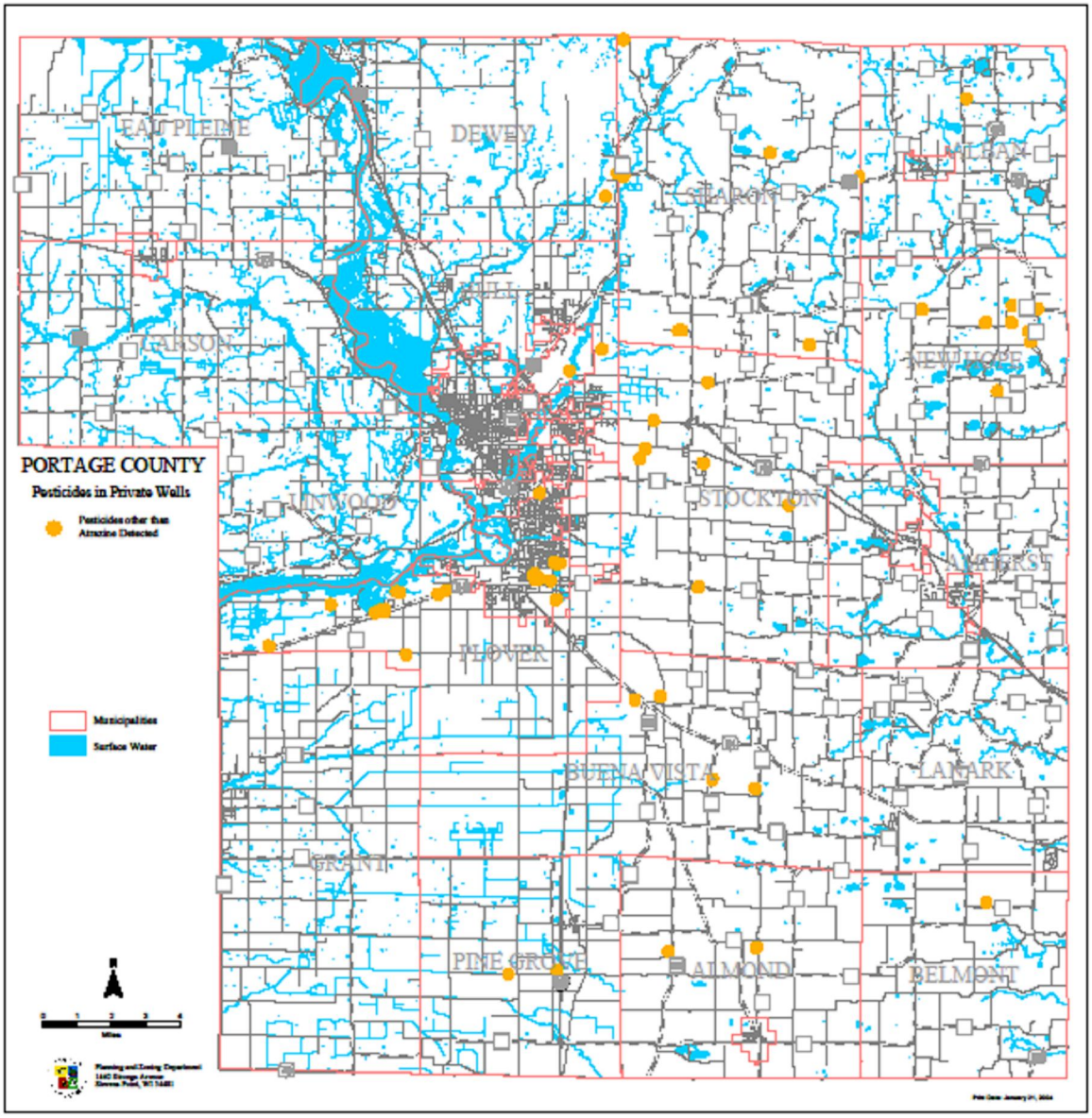


Figure 4.7

Atrazine Detected in Private Wells

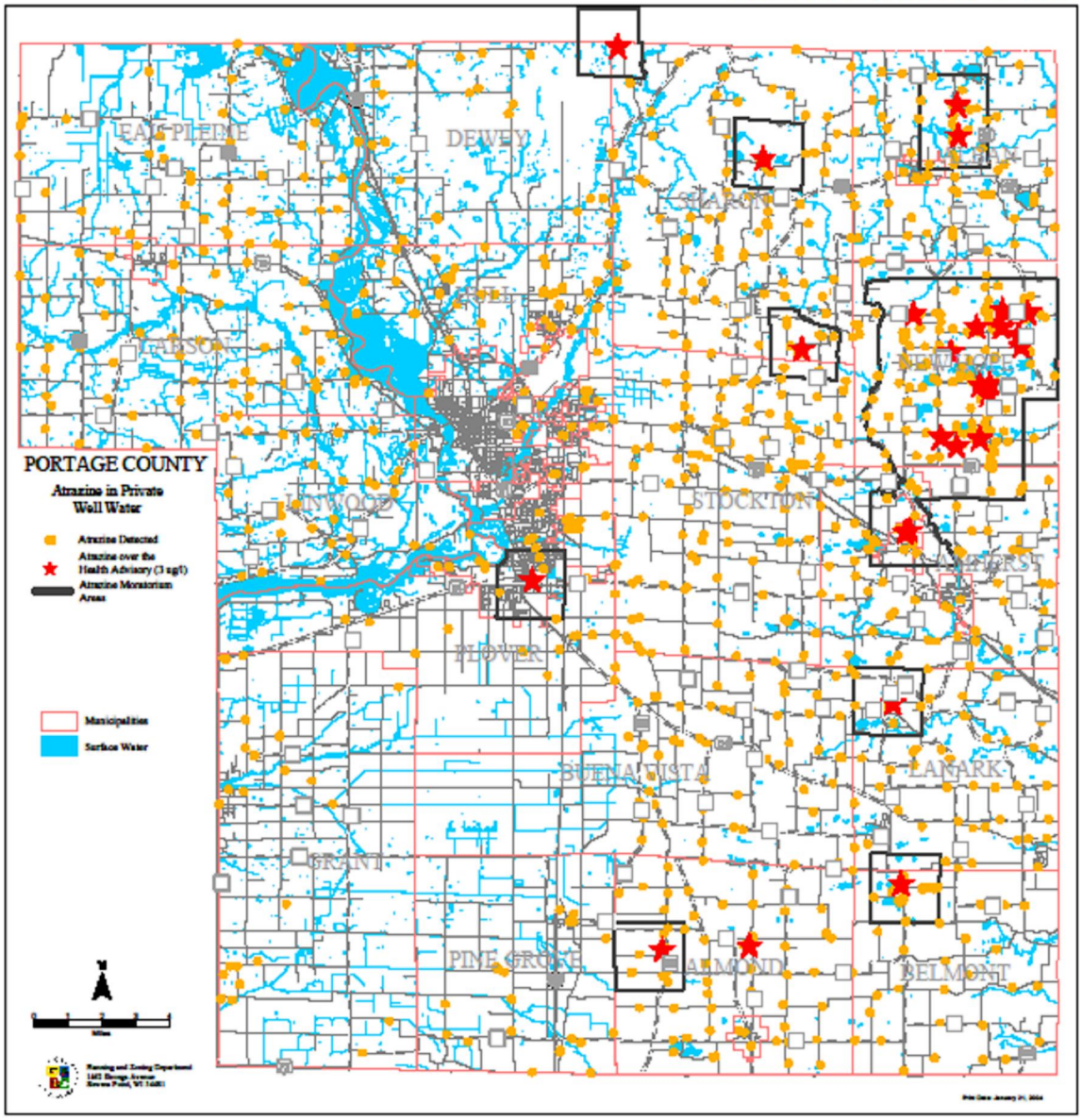


Figure 4.8

Alachlor ESA, one of the degradation products of the pesticide alachlor, is probably a common pollutantin County groundwater. A DATCP study found that 15% of wells tested in central Wisconsin contained this compound (DATCP, 1995, a survey of atrazine in Wisconsin groundwater). Some controversy existed over the level at which alachlor ESA should be regulated. The Wisconsin Division of Health has recommended an interim 20 parts per billion Health Advisory Level**. A DATCP survey in 2000 detected the presence of metolachlor ESA and Alachlor ESA in Stevens Point municipal well Number Ten.**

Metolachlor and metribuzin have been found in groundwater near where they are used, though not necessarily above standards. These have been found in monitoring wells down gradient of vegetable fields, but little is otherwise known about their distribution.

Data on the prevalence and toxicology of potential pesticide residues are not well established. Regarding drinking water standards for pesticides, the United State Geological Survey pointed out (1999, Distribution of Major Herbicides in Ground Water of the United States), "These criteria [drinking water standards], however, may not accurately reflect the overall health risks associated with pesticide detections in water resources because they have been established only for a relatively small number of pesticides and they do not account for the additive or synergistic effects of mixtures, impacts on the health of aquatic ecosystems, or the effects of pesticide metabolites."

Nitrate nitrogen is the most widespread groundwater contaminant (See Figure 4.9) in Portage County. It is not the most serious health concern, but it represents the magnitude of our groundwater contamination problem. It can be effectively used as an indicator of other highly soluble contaminants associated with land use. It changes the way we need to look at our groundwater. Our expectation of clean groundwater pumped from a well, or present in a stream, must be changed to recognize the likelihood that it is contaminated. The recommended goals in Section 6.0 do not accept this notion, calling for nitrate nitrogen levels to (eventually) reach safe levels throughout the County.

Nitrate nitrogen levels continue to rise in some areas of the County, most notably the Village of Whiting (Figure 4.10) wellfield, as predicted by research conducted by Dr. George Kraft in the 1990ôs. Though some small areas have shown declining nitrate nitrogen levels, as in the Village of Plover east well field, this is not the norm Countywide. Since nitrate nitrogen is one of the commonly tested groundwater parameters in private water well samples, a continual source of fresh data flows through the UWSP Water and Environmental Analysis Lab. Unfortunately, the samples submitted are not representative of all areas of the County.

Efforts made during the 1990ôs, by farmers and homeowners in cooperation with the Stevens Point ï Whiting ï Plover Wellhead Protection project, have had some limited success in reducing nitrate nitrogen loading to the groundwater in the municipal well recharge area. Unfortunately, all of the efforts did not succeed in lowering levels of this contaminant areawide, only keeping levels from increasing quite as fast as they might otherwise.

The areas of the County most affected by high nitrate nitrogen levels are in the areas of agriculture (especially irrigated) on sandy soils, and in areas of small lot residential development. Especially high levels, in excess of 60 parts per million, are found along the groundwater divide northwest of Almond.

Nitrate Nitrogen in Private Wells

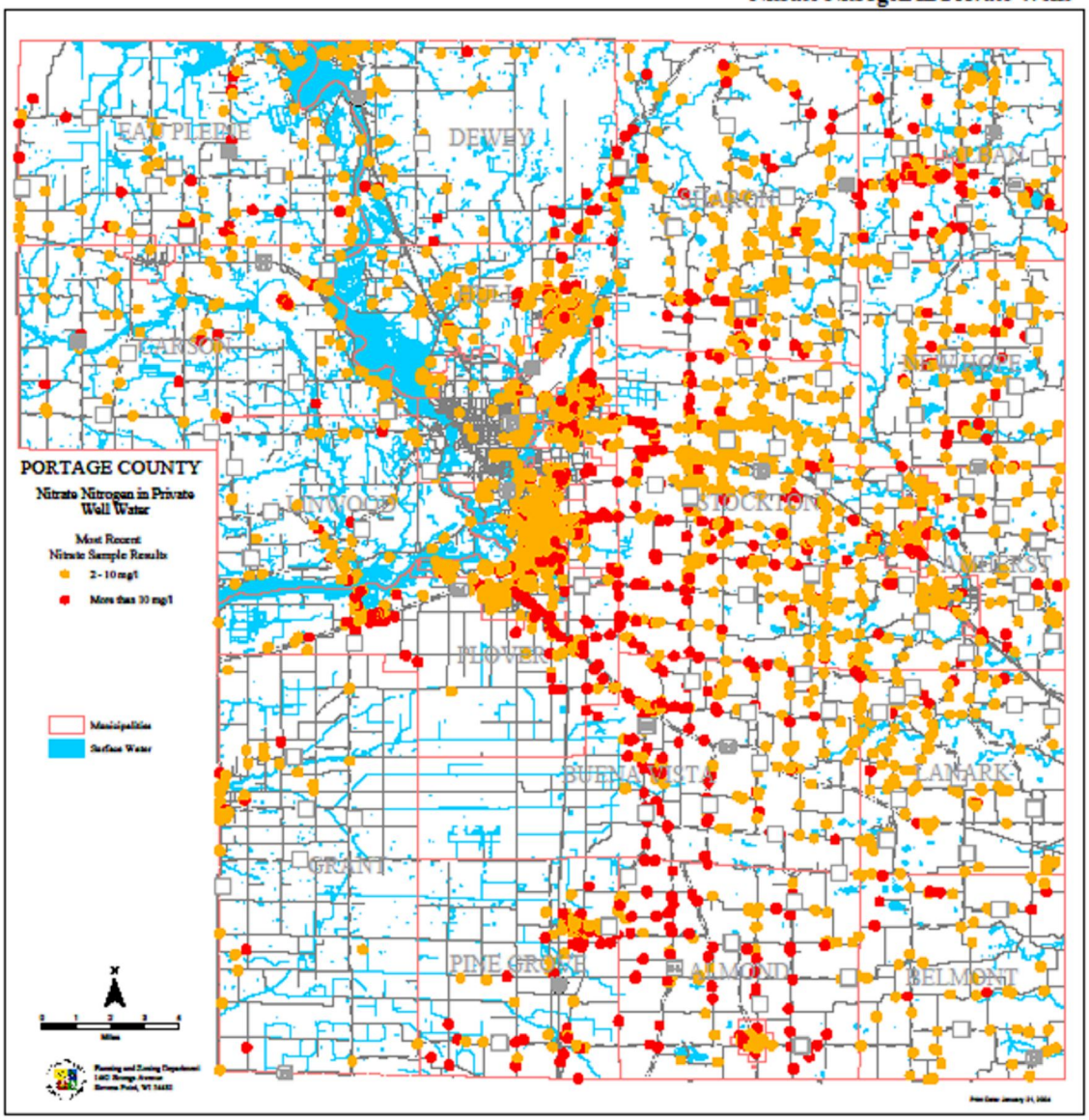
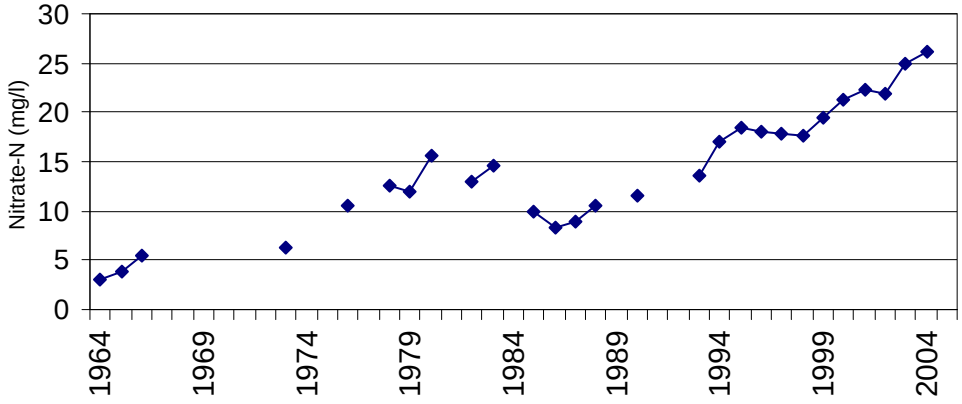


Figure 4.9

Figure 4.10 Nitrate Nitrogen Trend in Whiting Municipal Well



SECTION 5.0 MANAGEMENT TECHNIQUES AND OPTIONS

SECTION 5.1 EXISTING STATE REGULATORY AND PUBLIC INFORMATION FRAMEWORK

The 1983 Groundwater Protection Act created Chapter 160, Wis. Stats., which serves as the backbone of Wisconsin's groundwater protection program. Chapter 160 provides a multi-agency comprehensive regulatory approach, using two-tiered numerical standards, based on the premise that all groundwater aquifers in Wisconsin are entitled to equal protection. Each State regulatory agency must promulgate rules to assure that the groundwater standards are met and to require appropriate responses when the standards are not met.

The State regulatory agencies are the Department of Natural Resources (DNR) (solid and hazardous waste, industrial and municipal wastewater, spills, wetlands and water supply); the Department of Commerce (DOC) (private sewage systems, petroleum product storage tanks); the Department of Agriculture, Trade and Consumer Protection (DATCP) (pesticide use and storage, and fertilizer storage); and the Department of Transportation (DOT) (salt storage). In addition, Chapter 160 directs the Department of Health and Family Services (DHFS) to recommend health-based enforcement standards for substances found in groundwater, and specifies the protocol for developing the recommended standards.

The purpose of this chapter is to describe groundwater management programs and implementation of ch. 160, Wis. Stats., by the individual State agencies in FY 03. In addition, the University of Wisconsin System, UW Extension and the Wisconsin Geological and Natural History Survey (WGNHS) carry out numerous educational, research, monitoring, and outreach activities related to groundwater protection.

Department Of Natural Resources

The Department of Natural Resources (DNR) has statutory authority as the central unit of State government to protect, maintain, and improve the quality and management of the waters of the State, ground and surface, public and private (s. 281.11 Wis. Stats.). The DNR establishes groundwater quality standards under authority of ch. 160, Wis. Stats, and has specific groundwater-related regulatory programs, which are the responsibility of four Bureaus:

1. Drinking Water and Groundwater ï Regulates public water systems, private drinking water supply wells, well abandonment, and high capacity wells. The Bureau also educates well drillers, pump installers, and water system operators, and publishes materials to educate well owners. The Bureau's Groundwater Section coordinates groundwater activities of the DNR, as well as other State agencies. In particular, the Groundwater Section is responsible for adoption and implementation of groundwater standards contained in ch. NR 140, Wis. Adm. Code.

2. Waste Management - Regulates and monitors groundwater at proposed, active, and inactive solid waste facilities and landfills. The Bureau reviews investigations of groundwater contamination and implementation of remedial actions at active solid waste facilities and landfills. The Bureau also maintains a Groundwater and Environmental Monitoring System (GEMS) database of groundwater quality data from over 600 solid waste facilities and landfills to evaluate whether sites are impacting groundwater quality.

3. Remediation and Redevelopment - Oversees responses at spills of hazardous substances and hazardous waste sites, brownfields, leaking underground storage tanks, closed wastewater and solid waste facilities, and sediment cleanups, including associated groundwater contamination.

4. Watershed Management - Regulates the discharge of municipal and industrial wastewater and land treatment of biosolids, issues permits for discharges from clean-up sites regulated by the Bureau for Remediation and Redevelopment, and has primary responsibility for regulating stormwater and agricultural runoff and waste from large animal feeding operations.

Bureau of Drinking Water and Groundwater

Groundwater standards. Chapter 160, Wis. Stats., requires the DNR to develop numerical groundwater quality enforcement standards and preventive action limits, for substances detected in, or having a reasonable probability of entering, the groundwater resources of the State. Chapter NR 140, Wis. Adm. Code, establishes these standards and a framework for their implementation, and currently contains groundwater quality standards for 122 substances of public health concern, 8 substances of public welfare concern, and 15 indicator parameter substances in NR 140.

Public hearings have been held on proposed amendments to NR 140 that revise existing groundwater quality standards for butylate, dacthal and naphthalene, and establish new NR 140 groundwater quality standards for molybdenum and alachlor ESA (ethane sulfonic acid), a breakdown product of the pesticide alachlor. These revisions to NR 140 are currently "on hold" pending submittal of results of a recently completed alachlor ESA toxicological study by Monsanto, the manufacturer of alachlor.

A table listing NR 140 regulatory standards and advisory level groundwater quality standards, NR 809 State drinking water standards, and health advisory levels (HALs) for substances in water, provides a useful source of information about the safety of drinking water and groundwater contamination. It is available on the Internet at: *http://www.dnr.state.wi.us/org/water/dwg/health/hal.htm.* Links in this table allow users to obtain additional toxicological and health related information on many of the substances listed.

- Groundwater monitoring and research. DNR continues to administer funds for management practice monitoring projects under *Wisconsin's Groundwater Research and Monitoring Program.* More details can be found at *http://www.dnr.state.wi.us/org/water/dwg/gw/research.htm*. Final reports and almost 100 research summaries are available at *http://www.wri.wisc.edu/wgrmp/wgrmp.htm*.

Groundwater monitoring well requirements, as specified under NR 141, are administered by Groundwater staff. Activities include consultation on well construction, random inspections of environmental drilling operations, and review of new technologies and their application.

Groundwater staff maintains the Groundwater Sampling Desk Reference and Field Manual, which provide detailed instructions on how to collect groundwater samples and make accurate monitoring measurements. These are available at *http://www.dnr.state.wi.us/org/water/dwg/gw/sample.htm*.

Groundwater data management. Groundwater data from the consolidated Groundwater Retrieval Network (GRN) system is available at *http://www.dnr.state.wi.us/org/water/dwg/*. GRN accesses groundwater data from three program database systems in the Bureaus of Waste Management, and Drinking Water and Groundwater, including information on over 293,500 wells. These wells represent public and private water supply wells, piezometers, monitoring wells, non-potable wells, and groundwater extraction wells. Data from the Bureau of Watershed Management's database system will be added in the near future to include data from monitoring wells associated with wastewater discharge permits.

Software related to well construction reports at *http://www.dnr.state.wi.us/org/water/dwg/gw/software.htm*, allows users to enter and search data, print paper copies, and export and import records. Forms available include:

- Monitoring Well Construction Form 4400-113A
- Monitoring Well Development Form 4400-113B
- Well/Drillhole/Borehole Abandonment Form 3300-5B
- Soil Boring Log Information Form 4400-122 and 122A
- Groundwater Monitoring Well Information Form 4400-89
- Groundwater Monitoring Inventory Form 3300-67
- First Water Quality Report Form (3300-77)
- Drinking Water Well Construction Report Form (3300-77A)

Wellhead protection. The DNR is the lead State agency for developing and implementing the Wisconsin Wellhead Protection (WHP) Plan to achieve groundwater pollution prevention in public water supply wellhead areas. A WHP plan must be developed for any new municipal water supply well constructed since May 1, 1992. The plan must be approved by the DNR's Public Water Systems Section. A WHP Plan is voluntary for any public water supply well approved prior to May 1, 1992.

The DNR continues a Statewide public information effort aimed at encouraging water utilities to protect their water supplies from potential sources of contamination through wellhead protection planning, including:

- *Teacher training* - worked with the Central Wisconsin Groundwater Center (CWGC) and the Wisconsin Geological and Natural History Survey (WGNHS) to sponsor groundwater workshops training teachers in the use of groundwater sand tank models, and giving the models to teachers to take back to their schools along with a variety of educational materials. The intent is to provide information for teachers to educate students ï and their parents ï to protect groundwater in their own communities.

- *Working with local communities on WHP planning* - assist communities with WHP planning, and work with the Wisconsin Rural Water Association in providing assistance. The DNR makes publications available to assist communities in their wellhead protection efforts.

- *Upgrading the WHP web pages at http://www.dnr.state.wi.us/org/water/dwg/gw/whp.htm* as new information becomes available, including an annotated bibliography and list of available publications, a list of contacts for more information, and sample WHP ordinances.

- *Promoting the Groundwater Guardian Program* - encourage local governments to become Groundwater Guardian communities and work with existing Groundwater Guardian communities.

- *Source Water Assessment Program* - funding regional groundwater modeling projects in 24 counties providing advanced WHP Area delineations of the 5, 50 and 100-year capture zones for each of the municipal wells in these areas. When completed, the program will have: 1) delineated source water protection areas for all public water systems in the State; 2) conducted inventories of significant potential sources of contamination within those areas; 3) determined the susceptibility for each system; and 4) made the results of the assessments available to the public. Security concerns resulting from the 2001 terrorist attacks curtailed the programôs initial goal of making all aspects of the assessment available to the public.

The information on potential sources of contamination is being used with well construction, hydrologic, geologic, and other information to determine each system's susceptibility to contamination. The SWAP assessment form and mapping application are at the leading edge of DNRôs efforts in integrating spatial and tabular data toward the goal of public health protection. Source water assessments for Wisconsinôs 19 drinking water systems that use surface water are available on the Internet at *http://www.dnr.state.wi.us/org/water/dwg/swap/index.htm*.

Groundwater components of watershed basins - Groundwater Section staff work with basin teams to develop specific groundwater priorities based on GRN data and land cover information. State of the Basin reports provide baseline information on surface water, groundwater and land resources, and document environmental needs, and identify priorities related to groundwater for the nonpoint source program.

Runoff management rules for stormwater infiltration, with performance standards to ensure compliance with chapter NR 140, Wis. Adm. Code, were promulgated in October 2002. Guidance for developers, land use planners, and government agencies, regarding stormwater practices that will meet the performance standards while preserving groundwater quality, is under development.

Arsenic in groundwater - elevated levels of naturally occurring arsenic, in a portion of Outagamie, Shawano, Winnebago, and Brown Counties affects approximately one out of three private drinking water wells sampled. The Bureau is tracking current and new technologies for treating arsenic that may be possibilities for small water systems in Wisconsin. A web page (*http://www.dnr.state.wi.us/org/water/dwg/arsenic/index.htm*) has been developed to provide information and updated recommendations.

Underground Injection Control program. The purpose of the Underground Injection Control (UIC) program is to ensure that any aquifer that meets the definition of an underground source of drinking water (USDW) is protected from contamination that may result from the use of injection wells. All aquifers of the State are considered to be USDWs.

High capacity wells. The Department of Natural Resources is authorized under statute to regulate wells on each property where the combined capacity of all wells on the property, pumped or flowing, is greater than about 70 gallons per minute (100,000 gallons per day over a 30 day period). Such wells are defined as high capacity wells. When a high capacity well is anticipated to have an adverse impact on the quality or quantity of water available to a public utility well, the Department must deny approval or to limit operation of the high capacity well.

Groundwater quantity and water withdrawal issues were highlighted by the interest of a major water bottling company in locating a high capacity well near two spring sites. The Department is continuing to address the potential impacts of the proposed wells through the review and approval process, but has limited authority in regulating groundwater withdrawals that may affect surface water resources.

Drinking Water and Groundwater web site - The web site (*http://www.dnr.state.wi.us/org/water/dwg/index.htm*) for Drinking Water and Groundwater provides easy access to information for consumers, well drillers and pump installers, and water system owners and operators.

Bureau of Waste Management - regulates and monitors groundwater at proposed, active, and inactive solid waste facilities and landfills, and groundwater contamination investigations and implementation of remedial actions at active solid waste facilities and landfills. Some closed town, city, and village landfills may be impacting groundwater.

Bureau of Remediation and Redevelopment

The Bureau for Remediation and Redevelopment (RR) is primarily responsible for implementing and aiding cleanups under the Spill Law, the Environmental Repair Law, federal programs (Superfund, Hazardous Waste Corrective Action, LUST, Brownfields), the Land Recycling Law and State Brownfield Initiatives, and at closed landfills. All cleanups are conducted according to WI Administrative Rules NR 700-750, Investigation and Remediation of Environmental Contamination, and NR 140, Groundwater Quality.

Cleanup of groundwater contamination. The Environmental Fund is used when contamination is significant, but private parties do not undertake the cleanup. Whenever feasible, the staff attempt to recover costs from responsible persons after the cleanups are undertaken.

Brownfields program. The RR program provides technical assistance, helps to clarify legal liability, and provides financial assistance to encourage local governments and private businesses to cleanup and redevelop brownfield properties. Brownfields are idle or underused industrial or commercial sites whose development is adversely affected by environmental contamination. Many brownfields have groundwater contamination. After an environmental investigation of the property, and cleanup of soil and groundwater contamination, the Department will provide a release from future liability for contamination on the property prior to issuance of the "Certificate of Completion".

The Site Assessment Grant (SAG) program funds the removal of aboveground and underground storage tanks and abandoned containers of hazardous substances, and environmental site investigations at contaminated properties, if the persons responsible for the contamination are unknown, cannot be located, or cannot pay for the activities. The Brownfields Green Space and Public Facilities Grant (ch. NR 173) helps local governments clean up brownfield sites that will have a long-term public benefit, including the preservation of green space, the development of recreational areas, or the use of a property by a local government. These grants can be used for remediation of soil and groundwater at a property.

Dry Cleaner Environmental Response Fund (DERF) Program - Fees paid by the dry cleaning industry provide program funding, through ch. NR 169, Wis. Adm. Code, for cleanup of soil and groundwater at sites contaminated by dry cleaning solvents.

Site closure rules for Petroleum Contaminated Sites (under PECFA). NR 746 and Comm 46 establish risk and closure criteria to determine whether petroleum contaminated sites can be closed using natural attenuation as a final remedy for groundwater contamination. Sites with contamination in low permeability (clay) materials can close after a site investigation, if all risk criteria are met and the groundwater contamination is stable or receding. For contamination in permeable materials, sites must meet all risk criteria and demonstrate, through monitoring, that groundwater contaminants are declining. Depending on the extent of soil contamination remaining at a contaminated site, a deed restriction may be required. NR 726 provides closure requirements for all other sites.

GIS Registry. This Internet (*http://gomapout.dnr.state.wi.us/org/at/et/geo/gwur/index.htm*) database is used with well construction requirements for private wells, and with setback distances for new municipal wells to replace the requirement to record groundwater use restrictions at the County Register of Deeds Office. Inclusion on the GIS Registry provides a means of notifying future owners or users of the property of the existence of soil and/or groundwater contamination. The Department works with Diggers' Hotline to make the GIS Registry information available to well drillers. The Bureau of Remediation and Redevelopment Tracking System (BRRTS) is available on the Internet at (*http://www.dnr.state.wi.us/org/aw/rr/brrts/index.htm*). These two linked databases make site specific information on open and closed remediation sites accessible to the public, particularly potential buyers and those wanting to install or replace a potable well on an affected property. Sites regulated by the Departments of Commerce and Agriculture, Trade and Consumer Protection are also included in the GIS Registry and BRRTS.

Bureau of Watershed Management

The Bureau of Watershed Management implements DNRôs Groundwater Standards Program primarily through the issuance of Wisconsin Pollutant Discharge Elimination System (WPDES) permits to communities, industrial facilities, and large privately owned wastewater systems, which discharge treated domestic or industrial wastewater to groundwater through land treatment/disposal systems. These systems include spray irrigation, seepage cell, and subsurface absorption systems. WPDES permits issued to these facilities contain groundwater monitoring and data submittal requirements that are used to evaluate facility compliance with ch. NR 140, Wis. Adm. Code, groundwater quality standards. Groundwater monitoring systems at existing facilities are upgraded as necessary.

The System for Wastewater Applications, Monitoring, and Permits (SWAMP) database, for holders of specific WPDES and general permits, stores facility specific information such as address, contacts, location, permit requirements, monitoring results, and violations of permit requirements for private and municipal wastewater treatment facilities, and contains current and historical information on groundwater and wastewater/biosolids treatment. Sampling results and site loading information are also available for land application of municipal and industrial biosolids, septage, and wastewater.

The Bureau assists unsewered communities, served by failing or inadequate private onsite wastewater treatment systems (POWTS) in their efforts to construct centralized wastewater treatment facilities, and issues permits to large POWTS (with a capacity of greater than 12,000 gallons per day) as a result of changes to Commerce Rules and a revised DNR/Commerce MOU.

Septage and sludge management - The Bureau of Watershed Management implements the regulations in chapters NR 113, NR 204 and NR 214, Wis. Adm. Code. NR 113 regulates septage management, and NR 204 governs the treatment and disposition of municipal wastewater treatment plant sludge. NR 113 and NR 204 incorporate federal septage and sludge standards. The Bureau regulates the land application of industrial sludge, liquid wastes and biosolids through NR 214. Chapters NR 113, NR 204 and NR 214 contain treatment standards and land application site requirements that are designed to prevent runoff to surface water or leaching of nutrients and pollutants to groundwater.

Agricultural runoff - There are currently 113 WPDES permits issued under the NR 243 permitting program for livestock operations (81% dairy; 9% poultry; 9% swine & beef) covering each of the operations that were at 1,000 animal units or higher. The trend of growing numbers of permit applications for operations with 1,000 or more animal units is expected to continue. Rules outlining Statewide performance standards and prohibitions for agricultural operations (nutrient management, manure storage design, clean water diversion, erosion control) became effective in October 2002. The performance standards and prohibitions have been a key component of the Department's Nonpoint Redesign Initiative, and are intended to further address impacts from animal feeding operations with less than 1,000 animal units.

Stormwater ï DNR has revised stormwater regulations under ch. NR 216, Wis. Adm. Code, and the revised rules will be effective in time for the 2004 construction season. The regulations will require nearly 200 municipal separate storm sewer systems to obtain permit coverage Statewide, and also require construction sites down to one acre of land disturbance, to have permit coverage to control erosion during construction. Permit holders will also be required to install post-construction practices to limit pollutant discharge after construction is completed (stormwater management). The Department developed performance standards (i.e. 80% sediment control, infiltration, peak flow, buffer requirements, etc.), which will be implemented through storm water permits, especially for new development.

Nutrient management plans ï The nutrient management performance standard, NRCS Standard 590 becomes effective January 1, 2005 for high priority areas in the State (source water areas, outstanding/exceptional resource waters, and impaired waters). The standard becomes effective for the remainder of the State in 2008. Federal, State and local agencies will be working to build the necessary resources and expertise to implement NRCS Standard 590.

*For more information, visit the following website (*http://www.dnr.state.wi.us *) or contact Todd Ambs at 608-264-6278 (Todd.Ambs@dnr.state.wi.us), or Mike Lemcke at 608-266-2104 (Michael.Lemcke@dnr.state.wi.us), DNR, PO Box 7921, Madison, WI 53707-7921.*

Department Of Agriculture, Trade And Consumer Protection

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

In compliance with the Wisconsin Groundwater Law, DATCP manages pesticides and pesticide practices, including storage, handling, use, and disposal of pesticides, and the storage of bulk quantities of fertilizer, to assure that established groundwater standards for contaminants are not exceeded. This may include prohibition of certain activities, including pesticide use. The agency also manages practices to "minimize" groundwater contamination to the extent "technically and economically feasible."

DATCP coordinates Wisconsin's "generic" and "pesticide-specific" State pesticide management plans (PMPs - previously known as SMPs) for protecting groundwater from pesticides. In FY 96, DATCP, in cooperation with DNR and other agencies, submitted Wisconsin's "Generic SMP for Protection of Groundwater from Pesticides" to the EPA, which accepted the Generic SMP in June 1996. According to the EPA "Pesticides in Groundwater Strategy" (1991), when EPA determines that a pesticide presents a significant risk of leaching to groundwater in a state, it may either cancel the registration of that compound, or allow the state to manage the pesticide to protect groundwater. The generic PMP presents a comprehensive review of Wisconsin's regulatory and non-regulatory efforts to prevent groundwater

contamination due to pesticides. This generic plan serves as a framework for pesticide-specific PMPs that EPA may require.

Enforcement standards have been established in Wisconsin, with additional standards proposed, for many known and potential groundwater contaminants, including over 30 pesticides. DATCP applies these standards and the Groundwater Law when addressing nonpoint and point sources of pesticide contamination in groundwater.

Non-Point Source Activities

Pesticides. DATCP's primary effort regarding nonpoint (due to general use) contamination of groundwater from pesticides continues to involve the herbicide atrazine. In response to concerns about atrazine contamination, DATCP amended administrative rule ch. ATCP 30 in 1992 to manage the use of atrazine to reduce or eliminate the potential for further groundwater impacts, and has revised the rule annually in response to additional detections of atrazine in groundwater. A set of 102 maps of atrazine prohibition areas, covering 1.2 million acres, have been incorporated into the rule. Information suggests that atrazine use has declined from peak levels in the late 1980ís and is now holding roughly constant. The decline in use is partly a result of the atrazine management rule and concern about groundwater contamination.

Nutrients. DATCP, through its land and water resource management program, provides funding primarily to counties to assist in the protection of water resources through farmer adoption of nutrient management planning. A portion of this funding is dedicated to the development and implementation of improved nutrient and pesticide management practices on farms, to maximize profitability, and to minimize excessive runoff of nutrients to surface and groundwater. Staff trains farmers, consultants, and local agencies on the principles of sound nutrient management and how to comply with performance standards.

Point Source Activities

Previous work by DATCP identified pesticide and fertilizer operations as possible point sources of groundwater contamination. Past problems included improper disposal of unwanted agricultural chemicals, lack of containment for spills, out-dated product handling methods, and poor understanding by workers in the industry of how small actions when continued over time lead to large problems. DATCP has worked to address these problems through point source prevention. In cases where environmental degradation has already occurred, DATCP oversees environmental cleanup of contaminated soil and groundwater.

Point source prevention for agrichemicals includes Agricultural Clean Sweep, enforcement of product containment rules and handling regulations, and education beyond the rule requirements through the Environmental Partners program. Point source cleanup activities are performed under the Agricultural Chemical Cleanup Program (ACCP), which provides technical oversight and reimbursement to offset much of the costs for investigation and cleanup.

Since 1990, the Agricultural Clean Sweep program has helped farmers dispose of unwanted pesticides, farm chemicals, and empty pesticide containers. Beginning in 1996, the program extended collection services to small agricultural businesses.

DATCP's rules for minimizing environmental damage from agrichemical storage and handling were put in place in 1988. Fifteen local DATCP specialists work with facilities across the State to keep them in compliance with the ATCP rules designed to protect the environment. DATCP staff educates facility managers and employees about how routine practices may affect the environment.

The Environmental Partners program, with the agrichemical industry and Department working together to identify problems and brainstorm ideas to reduce pollution, works to reduce the amount of agrichemicals that escape into the environment. In this voluntary program, ideas used to solve problems at each facility are shared so that everyone can learn and benefit.

In August 1993, section 94.73 of the Wis. Stats. established the Agricultural Chemical Cleanup Program (ACCP) to address point sources of contamination. The ACCP reimburses responsible parties for cleanup costs related to pesticide and fertilizer contamination at facilities and in nearby wells, and point source contamination on farms. More that 350 cases involving soil and groundwater remediation related to spills, misuse, and improper storage or mixing and loading have been initiated at pesticide and fertilizer facilities, and on farms.

The ACCP also funds DATCP oversight of pesticide and fertilizer cleanup activities, including investigation, sample collection, laboratory analysis, and financial auditing. Investigations at pesticide and fertilizer contaminated sites are prioritized based on suspected contamination levels, and include discussions with facility staff or farmers to determine the most likely locations of contamination.

Groundwater Sampling Surveys

DATCP conducts a number of annual surveys to investigate the occurrence of pesticides in groundwater resulting from nonpoint sources.

Exceedence Survey. From 1995-2002, DATCP has conducted a sampling program of private wells that have previously exceeded a pesticide enforcement standard, with most of the wells in atrazine prohibition areas. 150 wells have been re-sampled at least once in this program for common pesticides and nitrate.

Pesticide and Groundwater Impacts Study. In 1985, DATCP began a study to determine if normal field application and use of pesticides and fertilizer was causing groundwater contamination at highly susceptible sites (e.g. sandy soils, less than 25 ft. to groundwater). As many as 50 different fields have been sampled each year. Currently, 22 sites are being monitored. This monitoring well network is maintained primarily as an early warning system for newly introduced pesticides.

Monitoring Reuse of Atrazine in Prohibition Areas. Ch. ATCP 31, Wis. Adm. Code, requires DATCP to collect scientific data to show, if renewed use of atrazine in prohibition areas will cause further groundwater contamination. In FY 98, DATCP began a five year study of the limited reuse of atrazine in selected prohibition areas, monitoring groundwater quarterly at 17 fields, 10-40 acres in size.

Atrazine Rule Evaluation Survey. In 1994 and 1996, DATCP completed groundwater sampling surveys designed to evaluate the effectiveness of the Atrazine Rule (ch. ATCP 30, Wis. Adm. Code). These surveys were designed to determine how levels of atrazine and its metabolites in groundwater were changing three and five years after the atrazine restrictions went into effect. In 2000 and 2001, 336 private wells were sampled across the State, including 122 of the same wells sampled in 1996, with results summarized in the May 2002 report ñGroundwater Quality: Agricultural Chemicals in Wisconsin Groundwaterò, which may be downloaded at *http://datcp.state.wi.us/arm/agriculture/land-water/water-quality/monit_proj.html*.

Research Funding

DATCP's research fund, based on fees (approximately $135,000 annually) paid by pesticide manufacturers, supported three continuing pesticide research projects during FY 03 to 1) evaluate pesticide and nitrate leaching on soils receiving manure, 2) evaluate agrichemical residues in two groundwater basins, and 3) to determine the occurrence of antibiotics in wastewater effluents and their mobility in soils.

Groundwater Data Management

Up-to-date, reliable data about pesticide and nitrate-N contamination of groundwater is essential in development of substance specific rules about pesticide use, such as DATCP's "Pesticide Product Restrictions" (Chapter ATCP 30, Wis. Adm. Code), in response to location specific citizen requests for groundwater quality data, and for initiation of timely investigations of pesticide contamination of groundwater. Because DATCP uses its data for regulatory purposes, it maintains the high quality of its databases by carefully cross-referencing lab slips and computerized data from DATCPôs laboratory, DNR, and other local and State agencies to coordinate groundwater data collection, and to assure the integrity of groundwater data in Wisconsin.

DATCP maintains two groundwater sample databases containing information for over 37,000 wells, and over 217,000 pesticide and nitrate-N results, representing samples analyzed by DATCP, SLOH, and other public and private laboratories. The Drinking Water Well System contains contact and location information, and well characteristics for private and public drinking water wells, while the Monitoring Well System contains similar information for monitoring wells, and also tracks specific pesticide use history, soils, crop history, well construction, and precipitation and irrigation at monitored sites.

DATCP uses geographic information system (GIS) tools for groundwater data analysis and map preparation for public information meetings and hearings, and DATCP board meetings. DATCP prepares and maintains ArcInfo and ArcView data layers of well locations, atrazine concentrations, atrazine prohibition areas, and other pesticide and nitrate-N data. These GIS layers and associated database information are used to generate maps of Statewide pesticide and nitrate-N detections in wells, as well as maps for chapter ATCP 30, Wis. Adm. Code (Pesticide Product Restrictions). DATCP also uses global positioning system (GPS) receivers to locate and map wells and other features, such as agrichemical facilities and spill sites that may affect groundwater quality.

*For further information, visit the following web site (*http://datcp.state.wi.us*) or contact Nicholas Neher, DATCP, 2811 Agriculture Drive, PO Box 8911, Madison, Wisconsin, 53708-8911; phone: 608-224-4567; e-mail: nicholas.neher@datcp.state.wi.us.*

Department Of Commerce

Chapter Comm 10, Wis. Adm. Code, regulates flammable and combustible liquids, and hazardous substance liquids, on the Comprehensive Environmental Response Compensation Liability Act (CERCLA) list. The regulatory authority for the storage tank program is within the Division of Environmental and Regulatory Services (ERS) in the Department of Commerce. The ERS Division has two bureaus: Petroleum Products and Tanks, and PECFA.

Under 145.02, Wis. Stats., the Department of Commerce also has the responsibility of safeguarding public health and the waters of the State by regulating the construction, installation, and maintenance of plumbing under State code chapters Comm 81-87. Chapter Comm 83, addressing Private Onsite Wastewater Treatment Systems (POWTS) is administered by the Division of Buildings and Safety.

Plumbing ï Graywater Reuse, Stormwater, and Private Onsite Wastewater Treatment Systems (POWTS)

The State Uniform Plumbing Code, Chapters Comm 81 ï 87, was revised effective May 1, 2003, and additional revisions are under consideration. In addition to public health and safety, the water supply and quality issues facing Wisconsin are a focus of the General Plumbing and POWTS programs in the Department of Commerce.

General Plumbing ï Graywater Reuse and Stormwater Use. In May 2003, Chapter Comm 82 of the plumbing code was revised to specify the plumbing system treatment performance standards for stormwater reuse. Also within the plumbing code are the requirements for graywater (lavatory, shower, laundry)

treatment and reuse. These options for stormwater use and graywater reuse will maintain high safety and health standards, while providing the impetus for Wisconsin citizens to learn more about water conservation issues.

Private Onsite Wastewater Treatment Systems (POWTS). The POWTS code, Comm 83, implemented on July 1, 2000, allows for innovative waste treatment systems, which meet ñperformance standardsò for treatment rather than simply prescribing certain types of soil absorption based systems. POWTS can be sited on soils previously considered unsuitable for soil absorption sewage treatment. Even with the availability of additional onsite treatment options, most property owners continue to choose the same types of POWTS that were available under the previous code. The majority of these standard POWTS designs are being selected from the conventional, mound, pressure distribution, at-grade, and holding tank component manuals. Written management and contingency plans are now required to alert the owners of POWTS to the need for regular inspection, servicing, or maintenance. These plans provide for mandatory POWTS scheduled maintenance and reporting of maintenance events over the life of the POWTS. The number of State registered POWTS Maintainers continues to increase, and continuing education provided by private vendors and UW Extension will help insure that the maintenance requirements are met. Revisions to Comm 83 code will be implemented early in 2004. The Department continues to communicate with the Department of Natural Resources regarding mutual issues such as large onsite sewage systems.

Petroleum Product and Hazardous Substance Storage Tanks

The ERS division continues to maintain regulatory oversight of aboveground and underground petroleum and CERCLA hazardous substance storage tanks in the Comm 10 administrative code. Underground storage tank (UST) regulations include the Federal EPA Underground Storage Tank requirements, as well as heating fuels and emergency generator tanks rules. Comm 10 was recently revised to update adopted standards and technical requirements to address current needs and technology.

Nearly 177,000 USTôs are now inventoried, as previously unregistered tanks have become registered. As of June 6, 2003, the database inventory of petroleum product tanks regulated under Comm 10 included 79,120 federally regulated tanks, with only 12,664 of them in use. In order to maintain a federally regulated tank in use, the tank must have a valid ñpermit-to-operateò and an annual inspection. Annual inspections involve verification of leak detection, spill and overfill protection, and record keeping. Permit renewal review includes assessment of the ownerôs financial responsibility.

Program initiatives have resulted in identifying more USTôs, reducing the number in use, and upgrading USTôs in use to meet the State and federal upgrade requirements. The closure of federally regulated tanks will continue, but at a slower pace than experienced over the past few years. Closure of unused residential heating fuel tanks is continuing at a strong pace, as the potential problems and liability are recognized.

Existing, aboveground, bulk storage facilities were subject to release prevention upgrade requirements in 2001, providing an enhanced measure of environmental protection over the former levels of acceptance, and reducing the number of bulk plants by approximately 30%.

Proactive educational outreach efforts and annual inspections by the Department and its agents continue a high level of regulatory compliance, with a corresponding reduction of environmental contamination from system failures.

Petroleum Environmental Cleanup Fund Act (PECFA)

The PECFA program, supported by the petroleum inspection fee, reimbursed petroleum storage tank system owners approximately $1.3 billion (from August 1989 through June 2003) for investigation and remediation of petroleum contamination in both soil and groundwater. The program, in addition to auditing owner invoices and authorizing payments, performs technical reviews of site investigations, remedial options, and grants closures for the majority of the Stateôs leaking underground storage tank (LUST) sites. Currently, PECFA is making reimbursement payments approximately 6 months after the claim is received. The Department uses competitive bidding, to establish a reimbursement cap for investigation and cleanup activities, at contaminated sites where total costs are expected to exceed $60,000. Commerce has

completed the bidding process for 400 sites. The Department is currently reviewing existing sites that have been reimbursed more than $200,000, to evaluate the status of these sites.

Data Management

Commerce maintains databases of properties with either past or current petroleum contamination and underground petroleum storage tank systems. The database also stores information on activities associated with onsite sewage system design, installation, and maintenance. The Department is studying whether Sanitary Permit information collected by counties may be integrated with information on POWTS servicing, maintenance, and inspection activities that are required to be reported and tracked.

*For more information, visit the following web site (*http://www.commerce.state.wi.us*) or contact Berni Mattsson, ERS Division Administrator, P. O. Box 7839, Madison, Wisconsin 53707-7839, phone: 608-266-9403, fax: 608-267-1381; e-mail* bmattson@commerce.state.wi.us*.*

Department Of Health And Family Services

Chapter 160, Wis. Stats., directs the Department of Health and Family Services (DHFS) to recommend health-based enforcement standards for substances found in groundwater, and specifies the protocol for developing the recommended standards. Recommended standards are sent to the DNR to be submitted as amendments to ch. NR 140, Wis. Adm. Code. DHFS staff serves as a primary resource for information about the health risks posed by drinking water contaminants, and are charged with investigating suspected cases of water-borne illness. Toxicologists, public health educators, and epidemiologists employed in the Departmentôs Division of Public Health present this information to the public at meetings and conferences, and provide direct assistance to Wisconsin families via home visits, letters to well owners, and telephone consultations, and a wide variety of informational materials on groundwater and drinking water issues related to human health.

DHFS staff review correspondence sent to well owners by DNR, and provide supplemental advice to owners of wells that are highly contaminated with volatile substances such as benzene and vinyl chloride, especially in cases where the contaminants may pose concerns from inhalation of indoor air. Follow-up letters sent by DHFS explain the health effects of specific contaminants and suggest strategies for reducing exposure until a safe water supply can be established. DHFS staff also reviews the toxicity of constituents of well construction and rehabilitation products to ensure that products approved for use in Wisconsin can be used safely without risk of chemical overexposure.

Summary of Agency Activities in FY 03

The Natural Resources Board approved five proposed groundwater enforcement standards for public hearing in June 2002. DHFS staff has reviewed comments and preliminary data from a new study on the toxicity of the ethane sulfonic acid (alachlor ESA) metabolite of alachlor. Once these reviews are complete, DHFS will forward final recommendations to the DNR for consideration by the Natural Resources Board. In May 2003, DHFS submitted a supplemental recommendation to reduce the groundwater enforcement standard for arsenic from 50 µg/L to 10 µg/L, consistent with new Federal regulations.

In the fall of 2002, DHFS staff worked with representatives of the Centers for Disease Control to determine whether methyl-t-butyl ether (MTBE) can be detected in the blood of residents exposed to low levels (1ï 5 µg/L) in public water systems. MTBE is a motor fuel additive (designed to reduce air pollution) that has become a persistent and problematic groundwater contaminant in many parts of the United States. Preliminary findings suggest that MTBE can be detected in the blood of people who consume water with low-level MTBE contamination, and there appears to be a low background level of MTBE exposure from motor vehicle use that is detectable in residents of rural Wisconsin.

During 2002-2003, DHFS staff worked with State and federal environmental health agencies to develop concepts and methods for the investigation of organic vapor intrusion into residences and commercial buildings. Vapor intrusion describes a hydrogeological scenario where petroleum or solvents dissolved in contaminated groundwater vaporize, move upward through spaces between soil particles, and ultimately enter buildings through spaces in the foundation. Investigating the health threat from this exposure pathway is a rapidly emerging area of environmental science.

DHFS staff has been active in research and outreach activities relating to naturally-occurring arsenic in groundwater in Winnebago, Outagamie, and Brown Counties. Long-term exposure to arsenic in drinking water has been shown to contribute to increased risk of skin, lung and bladder cancers, as well as a number of cardiovascular and dermatological problems. Other conditions that may be related to arsenic exposure include diabetes and adverse reproductive outcomes. People over the age of 50 were more likely to report a diagnosis of skin cancer, if they had consumed water that had an arsenic concentration greater than 5 µg/L for 10 years or more. Cigarette use was also associated with higher skin cancer rates: residents who both smoked and consumed arsenic-contaminated water reported the highest skin cancer prevalence rate.

For more information, visit the following web page (*http://www.dhfs.state.wi.us/eh/Water/index.htm*) or contact Henry Anderson (608-266-1253; *anderha@dhfs.state.wi.us*), Lynda Knobeloch (608-266-0923; *knobelm@dhfs.state.wi.us*) or Mark Werner (608-266-7480; *wernema@dhfs.state.wi.us*), 1 W. Wilson St., Rm. 150, Madison, Wisconsin, 53701.

Wisconsin Geological And Natural History Survey

The Wisconsin Geological and Natural History Survey (WGNHS) performs basic and applied groundwater research, and provides technical assistance, maps, and other information and education to aid in the management of groundwater resources, and in the understanding of groundwater recharge, occurrence, quality, and movement.

Groundwater Level Network

The Statewide groundwater-level monitoring network has been operated jointly with the U.S. Geological Survey (USGS) since 1946. Currently, the network consists of approximately 140 wells in 66 counties. The groundwater-level monitoring network provides a consistent, long-term record of fluctuations in water levels in deep and shallow aquifers. Such information is critical for accurate analyses of the effects of high-capacity well pumping, the response of groundwater levels to droughts, and the effects of land-use changes on groundwater systems. The long-term data (available on the USGS web site at *http://wi.water.usgs.gov/gw/*) are also used for calibration of regional groundwater models.

County and Regional Groundwater Studies

County studies. Geologic and groundwater studies at the county scale were carried out during FY 03 in Dane, Calumet, Fond du Lac, La Crosse, and Waukesha Counties.

Geologic and hydrogeologic analyses in southeastern Wisconsin. A quantitative study of the deep sandstone aquifer, which provides most of the water to the high-capacity wells serving the southeastern Wisconsin communities of Waukesha, Brookfield, Germantown, Menominee Falls, and Pewaukee, among others, was carried out. Concerns exist that rapidly falling groundwater levels indicate that water supply will not be able to keep pace with development.

Groundwater Research Activities

Aquitard research. In late 2001, the WGNHS received a grant for evaluation of the properties of aquitards in Dane County and southeastern Wisconsin. During 2002, the project team developed a bibliography and state-of-the-science report on aquitard hydrogeology. During 2003, the team investigated aquitards at field sites in Dane, Waukesha, and Adams Counties.

Arsenic in groundwater. The WGNHS, with DNR support, is carrying out research on the source(s) and geochemical characteristics of arsenic contamination in water-supply wells in northeastern and southeastern Wisconsin. In FY 03 the WGNHS completed a project in the Fox River Valley that evaluated mechanisms of arsenic release to groundwater from domestic wells completed in the St. Peter sandstone aquifer, including the effects of well chlorination on arsenic levels. DNR staff is using the information to develop well construction guidelines for affected areas within Outagamie and Winnebago Counties.

Groundwater recharge. Groundwater recharge is critical to maintaining the supply of Wisconsin's groundwater, but mapping and quantifying recharge areas and rates can be a difficult process. In cooperation with UW-Madison, the WGNHS has developed a computerized technique for rapidly delineating recharge areas for use in regional groundwater models. This method couples GIS techniques with basic landscape data and rainfall-runoff modeling, and is being tested in Dane County.

Effects of land-use changes on temperature in trout streams. During FY 02 and 03, the WGNHS conducted a study of how land-use changes affect groundwater recharge, and how recharge changes, in turn, impact the discharge and surface-water temperatures in trout streams.

Crandon Mine. The WGNHS has also been actively assisting the DNR in its review of the proposed sulfide mine near Crandon, Wisconsin. This review includes development and testing of groundwater flow and contaminant transport models being used to evaluate the potential effects of the mine on local groundwater and surface-water features.

Investigation of unsewered rural subdivisions. Population growth and urban expansion in many areas has resulted in residential development on formerly agricultural land, but there have been few studies of the impacts of such developments on groundwater quality. To document the effects of this land-use conversion on groundwater quality, the WGNHS initiated a monitoring program to collect water-quality data before, during, and after construction of a new, unsewered subdivision located on agricultural land several miles outside of Madison, Wisconsin. This project is one of the first scientifically rigorous studies of the before-and-after impacts of rural subdivisions in the United States.

Groundwater Education

WGNHS groundwater education programs for the general public are usually coordinated with the UW-Extension county-based faculty, the DNR, the Central Wisconsin Groundwater Center, or the UW-Extension Environmental Resources Center. The WGNHS also produces and serves as a distributor of many groundwater educational publications and visual aids. We also provide a collection of representative Wisconsin rocks for teachers to use, which include samples of our major aquifers.

Groundwater Data Management

Computerized groundwater databases, including geographic information systems (GIS) data, continue to be developed at the Survey, usually on a project basis to assist with ongoing research. A high priority is to make high quality, accurate digital datasets available to State agencies and the public. In FY 03, the WGNHS developed a version of the primary geologic database for distribution to the general public in

digital format. This database, called WiscLith, contains lithologic and stratigraphic descriptions of geologic samples collected from across the State. The database is searchable by location, stratigraphy, and lithology. The database will be published on CD-ROM and will be available in the first quarter of FY 04.

The WGNHS serves as the repository for 1936ï 1995 Well ConstructorsôReports, one- to two-page reports that are usually submitted to the DNR by a well driller within a few months of a wellôs completion. Approximately 400,000 of these reports are on file at the Survey. Approximately 350,000 of the Well ConstructorsôReports (those covering 1936ï 1989) have been scanned, and information has been entered into a basic database. The database and scanned images are now available on CD-ROM. The computerization of these records allows WGNHS to provide better, more usable information to the public. Locational information on the Well ConstructorsôReports is scrutinized and updated during our County and regional studies. The development of a separate Statewide database for approximately 36,000 geologic logs and drillcores is ongoing.

For more information, contact Ken Bradbury, Wisconsin Geological and Natural History Survey, 3817 Mineral Point Road, Madison, Wisconsin, 53705-5100; phone: 608-263-7389; email: *krbradbu@facstaff.wisc.edu;* web site: <*http://www.uwex.edu/wgnhs/*>.

Department Of Transportation

The Department of Transportation (DOT) regulates the storage of highway salt (ss. 85.17 and 85.18, Wis. Stats.) to protect the waters of the State from harm due to contamination by dissolved chloride. DOT is also responsible for potable well sampling at 29 rest areas and 102 waysides. Other DOT groundwater related activities include:

- Salt Use and Storage - Bureau of Highway Operations
- Salt Research - Bureau of Highway Construction (Geotechnical Section)
- Hazardous Materials (petroleum) - Bureau of Environment
- Hazardous Waste - Division of Business Management (Risk & Safety Management Section)
- Wetlands - Bureau of Environment
- Erosion Control and Storm Water Management - Bureau of Environment
- Potable Well Sampling - Bureau of Highway Operations

Salt Storage

Highway salt is stored Statewide by suppliers, counties, cities, villages, and private companies. Annual inspections occur, and reports are provided for salt storage sites to insure that storage practices are in accordance with ch. Trans 277, Wis. Adm. Code (Highway Salt Storage Requirements). The intent of the Code is to help prevent entry of highway salts into waters of the State from storage facilities. All salt must be covered and stored on an impermeable base. The base for stockpiles is required to function as a holding basin and to prevent runoff. The covers must consist of impermeable materials or structures to prevent contact with precipitation. State funded facilities are being added to the DOT salt storage program to provide greater capacity of indoor storage, thus improving groundwater protection.

The DOT annually updates salt storage facility records and assists the DNR source water protection program in locating salt storage facilities. There are currently 1,193 salt storage sites (and 2,294 sub-sites) listed in the database. Each county updates monthly a detailed inventory of salt facilities, including quantities, inspections, repairs, and improvements.

Salt Use

The DOT Bureau of Highway Operations produces the Annual Winter Maintenance Report, describing Statewide salt use, based on weekly reports from each county. Current policy in the State Highway Maintenance Manual restricts the spreading of deicer salts to a maximum of 400 pounds per lane mile per initial application, and 300 pounds per lane mile for subsequent applications. Electronic controls for salt spreader trucks are continually tested to record and verify application rates and coverage effectiveness. Other new technology is used on county highway patrol trucks to keep salt on pavement surfaces (e.g.,

zero-velocity spreaders, ground speed controllers, and onboard liquid pre-wetting units). Additional efforts to minimize and conserve salt applications include the use of in situ weather monitoring system. Pavement temperature sensors recorded at 56 separate locations along major highway routes are used to help determine the timing and method of sand and salt application rates. Annual training for proper snowplowing and salt spreading techniques is provided for county snowplow operators.

Salt Research

Since 1970, DOT has investigated potential road salt impacts on the environment adjacent to highways. Early investigations (1970s to early 80s) were focused on evaluating road salt impacts to surface water runoff, vegetation, and soils. In the last several years, DOT has conducted limited investigations evaluating road salt impacts to groundwater (1 or 2 shallow monitoring wells per site). To date, approximately 20 sites throughout the State have been studied. In general, each site is monitored quarterly for a period of 5 years. The monitoring consists of analyzing soil, water, or vegetation samples for calcium, sodium, chloride, and electrical conductivity. Approximately 5 sites are currently monitored, and future groundwater monitoring plans are being evaluated. Results from the studies are discussed in five separate DOT progress reports entitled: Investigation of Road Salt Content of Soil, Water and Vegetation Adjacent to Highways in Wisconsin (1972, 1975, 1979, 1989 and 1996). The next progress report was due in 2003.

*For more information, visit the following web site (*http://www.dot.state.wi.us*) or contact Mr. Robert Pearson, Hydrogeologist, Bureau of Environment, Room 451, P. O. Box 7965, Madison, Wisconsin 53707-7965; phone: 608-266-7980, or e-mail* robert.pearson@dot.state.wi.us*.*

University Of Wisconsin System

The University of Wisconsin System (UWS) research, teaching, and outreach responsibilities are integrated through cooperation and joint appointments of Extension personnel who work on groundwater resource issues with UWS staff, and State and federal agencies. Citizen outreach is accomplished through use of publications, public meetings, teleconferences, water testing, and satellite programs.

UW Water Resources Institute (WRI)

The UW Water Resources Institute (WRI), one of 54 located at land grant universities across the nation, promotes research, training, and information dissemination focused on the nation's water resources problems. The WRI research includes interdisciplinary projects in four broad areas: groundwater, surface water, groundwater-surface water interactions, and drinking water. Groundwater is a top priority at the Wisconsin WRI.

Teaching. Institutions within the UWS offer undergraduate- and graduate-level courses and programs focusing on diverse issues regarding groundwater resources.

Information transfer**.** Results of WRI-supported research are published in a variety of formats. Most WRI research appears in refereed professional journals, although results are also published in technical reports. In addition, WRI disseminates groundwater research results through its Web site at *http://www.wri.wisc.edu/*. Staff members maintain a complete list of publications at *http://www.wri.wisc.edu/Publications/66-00pubs.html.*

The Groundwater Research and Monitoring Project Web page at http://www.wri.wisc.edu/wgrmp/wgrmp.htm presents summaries of the results of more than 100 completed Groundwater Research and Monitoring projects funded since 1989, and are updated as projects are completed.

The Online Directory, *http://www.wri.wisc.edu/wriexpertise/index.asp*, of Water Expertise and the Water Resources Library, first put online in 2000, contains more than 800 water experts, including groundwater professionals, and can be searched by area of expertise, research interests, or name. Users with an interest in water issues can contact the experts by phone, fax, or email

Water Resources Library**.** The Water Resources Library maintains a specialized collection of more than 25,000 water-related publications, 30 journals, and 100 newsletters. The collection covers all major topics in water resources, but is particularly strong in groundwater-related publications. A popular service is the Kï 12 water-related curricula collection. All materials are included in the UW-Madison online library catalog at *http://madcat.library.wisc.edu*. The Water Resources Library also maintains a Web site http://wri.wisc.edu/library, which serves as a gateway to water-related information on the Web, as well as a guide to the library. Web users can pose questions to AskWater, the libraryõs online reference service.

The online Wisconsin Water Library will loan books to all Wisconsin residents, offer lists of water-related books and Web sites by topic, and provide virtual reference-desk service. It was scheduled to go online in July 2003 at *http://aqua.wisc.edu/waterlibrary*.

For more information, visit *http://www.wri.wisc.edu/* or contact Dr. Anders W. Andren, director, UW-Madison Water Resources Institute, 1975 Willow Drive, Madison, WI 53706; phone (608) 262-0905, fax (608) 263-2063, or email *awandren@seagrant.wisc.edu*.

UW-Extension's Groundwater Center

The Groundwater Center is part of the Center for Watershed Science and Education at the UW-Stevens Point College of Natural Resources, and frequently works through County Extension faculty to provide groundwater education and technical assistance to the citizens and governments of Wisconsin. Information can be found online at *http://www.uwsp.edu/cnr/gndwater/*. Programs range from answering citizen questions to helping communities with wellhead protection planning, describing the extent and causes of groundwater nonpoint pollution in Wisconsin, and working on groundwater policy. In 2002, the Center assisted over 3,100 households in having their water tested at its Water and Environmental Analysis Laboratory. Eleven education programs helped nearly 900 well owners in six counties understand potential remedies for these bacteria and nitrate problems, and the relationship of land use practices to groundwater quality.

The Groundwater Center maintains a database of private well testing data from the Water and Environmental Analysis Laboratory at UW-Stevens Point. Chemistry data includes pH, conductivity, alkalinity, total hardness, nitrate-nitrite, chloride, saturation index, and coliform bacteria. In 1998, a new sampling program for iron, sodium, potassium, copper, lead, calcium, magnesium, manganese, zinc, and triazine was also initiated. Arsenic and sulfate were added late in 1999. The database primarily covers the period 1985 to the present, and can be easily queried by local communities and groundwater managers.

Center staff is playing pivotal roles in a number of State groundwater issues. Working with partners in the private and public sectors on groundwater quantity policy and law is a current priority for the Center. A continuing effort this year involves using the national Groundwater Guardian program to build the groundwater knowledge and leadership skills of Wisconsin citizens in order to develop a Wisconsin grass-roots groundwater constituency. In partnership with the DNR, the Center supports a Statewide Groundwater Guardian program coordinator. The program has developed outreach materials, including a display, presentation, and brochure; made numerous presentations to interested groups; assisted the seven existing Wisconsin Groundwater Guardian communities in carrying out their activities; and conducted the highly successful First Annual Groundwater Festival. More about the Wisconsin Groundwater Guardian program can be found at *http://www.uwsp.edu/cnr/gwguardian*.

Other UW-Extension Water Programs

UWS Farm and Home Environmental Management Program. The UWS Farm and Home Environmental Management Program encompasses voluntary pollution risk assessment and prevention activities. The program was known originally for its Farm Assessment System (Farm*A*Syst) and Home Assessment System (Home*A*Syst) projects and materials. The ñFarm and Homeò program is currently launching new

projects that build on previous lessons, and increasingly integrating water quality protection with other types of environmental citizenship.

Projects are designed to enable and motivate urban and rural landowners, managers and residents to assess environmental and health risks, and to take voluntary actions to prevent pollution from long-term investments such as the siting of structures, and from daily management practices. The Healthy Homes Partnership, an offshoot of Home*A*Syst offers materials via CD and on the Web, as well as the current print edition of Help Yourself to a Healthy Home.

The Wisconsin Dairy Environmental Management Systems (EMS) project is coordinating interest among WDNR, commodity and farm organizations, environmental organizations, and private sector advocates of EMS. One tangible benefit to farmers that has emerged is reduced insurance rates for pollution and general liability. The Wisconsin Milk Marketing Board is collaborating on a web site to explain to farmers the relationships among various State environmental programs. Farmers engaged with EMS implementation indicate that the framework has improved their sense of security about their farmôs environmental and health impacts.

- *Agricultural Environmental Management Systems: Farm Management for Improving Your Environmental and Economic Bottom Line*.

- *Drinking Water and MTBE: A Guide for Private Well Owners* (MTBE = Methyl tertiary-butyl ether). May be found on the web at: *http://www.uwex.edu/farmandhome/wqpaap/products.html*

- *Healthy Home Satellite Videoconference.* (2 hour videotape available at cost of production) Was broadcast on March 27, 2003 and featured presentations by content experts on asthma, mold, and integrated pest management. Participants had opportunities to interact with the experts through question and answer sessions. Information from: *www.uwex.edu/healthyhome/satvideoconf/*.

- *Healthy Home Web Tool, "Help Yourself to a Healthy Home".* Interactive Web site and Demonstration CD. For more information, visit *www.uwex.edu/healthyhome*.

- Agriculture EMS web site for general public education about agricultural environmental management systems: *www.uwex.edu/agems/*

- Wisconsin EMS web site for dairy farmers to conduct environmental assessments and planning as part of their EMS development: *www.uwex.edu/agems/dairy/wisems*

<u>UW Environmental Resources Center (ERC).</u> The ERC develops a number of national youth groundwater education initiatives, providing coordination for two youth water education programs, *Educating Young People About Water* (EYPAW) and *Give Water a Hand* (GWAH). The EYPAW guides, and more than 140 water-related curricula provide assistance, for developing a community-based, youth water education program. The EYPAW web site, *http://www.uwex.edu/erc/eypaw*, provides access to a database that may be searched by grade level or water topic. The goals of the GWAH curriculum, at *http://www.uwex.edu/erc/gwah*, are to protect and improve local water quality by encouraging youth to investigate local issues, plan and complete a service project, and then address a problem they identify with the assistance of a local natural resource expert. Another youth water education initiative includes *Agua Pura*, a leader institute planning manual and guide for Latino water education. Find links to these programs on the ERC web site at *http://www.uwex.edu/erc*.

<u>UW Nutrient and Pest Management (NPM)</u> In 1990, a broad coalition of agricultural organizations, environmentalists, and the University sought funding for a water quality program for farmers and the agricultural community. Over the past thirteen years, the NPM outreach program has conducted on-farm demonstrations and education throughout Wisconsin, to address groundwater and surface water contamination from agriculture, and the profitability of recommended practices.

A major portion of the programôs focus has been nutrient management ï the careful, profitable use of fertilizers and animal manures in crop production. During FY 02, NPM revised and distributed the *Nutrient Management Farmer Education Curriculum* that includes a discussion of nitrates in groundwater. NPM continues to work with Wisconsin farmers to ensure they are not over-applying nitrogen and other inputs so as to minimize potential losses to groundwater. More information on these efforts is available at the NPM web site (*http://ipcm.wisc.edu*).

Basin Education Program. The UWS cooperates with other State agencies involved with water resources and natural resource issues. In 1998, UW-Extension entered into a new partnership with the DNR and USDA-NRCS in Wisconsin. This new partnership provides land and water resources education in the State's 22 major river basins. Fifteen Basin Educators work collaboratively at the local (basin) level and receive State-level support for publication/educational material development, evaluation, and administration. More information can be found at *http://clean-water.uwex.edu/index.html*.

Multi-Agency Land and Water Education Grant Program (MALWEG). Coordinated by UW-Extension, MALWEG has funded ten groundwater-focused projects since its inception in 1997. These projects examined the effects of intensive rotational grazing on groundwater quality, provided well testing for rural landowners, and conducted Farm*A*Syst assessments to help farmers identify and address groundwater contamination on their property. More information can be found at *http://clean-water.uwex.edu/malweg/index.htm*. Altogether, between January 1, 1997, and December 31, 2002, 134 projects totaling over $1.8 million have been funded to improve Wisconsin's land and water resources.

For more information on UW Extension groundwater programs, contact Jim Peterson, UW Environmental Resources Center, 1545 Observatory Drive, Madison WI 53706-1289, phone (608) 262-3799, fax (608) 262-2031, or email *jopeters@wisc.edu*; or George Kraft, Center for Watershed Science and Education, College of Natural Resources, UW-Stevens Point, Stevens Point, WI 54481; phone (715) 346-4270; email *gndwater@uwsp.edu*.

Wisconsin State Laboratory of Hygiene

A great deal of effort in the Drinking Water Quality Program is focused on identifying and monitoring chemical and microbial contaminants in groundwater to protect the health of drinking water consumers through routine testing, emergency response, education and outreach, and specialized research services to the scientific and regulatory communities.

Contaminants routinely tested for, include all contaminants regulated by the federal Safe Drinking Water Act, as well as many emerging contaminants that appear on the USEPA Contaminant Candidate List. Another important focus of the WSLH Drinking Water Quality Program is emergency response to incidences involving groundwater contamination. For example, WSLH works with DHFS and DNR to investigate outbreaks of illnesses of unknown (possibly food or water) origin. Staff provides background information on the outbreaks for local public health officials, local media, and the general public. WSLH also responds to spills and incidents, and supports State agencies in remediation and emergency clean-up activities. Most recently, WSLH has focused its efforts on enhancing and expanding terrorism response programs.

For more information, visit the following website (*http://www.slh.wisc.edu/*) or contact William Sonzogni, Wisconsin State Laboratory of Hygiene, 2601 Agriculture Drive, Madison, WI 53703, phone (608) 224-6200, or email *sonzogni@facstaff.wisc.edu*.

SECTION 5.2 EXISTING LOCAL GROUNDWATER MANAGEMENT FRAMEWORK

Local groundwater management has developed over the years since the Groundwater Management Plan was adopted in 1988. Currently, groundwater protection activities are carried out by Portage County staff, and by staff of the municipalities within the County. The Planning and Zoning Department (P&Z) was named the lead agency for County groundwater management, and houses many of the Countyôs groundwater regulatory programs. The Groundwater Citizens Advisory Committee advises the Planning and Zoning Committee, of the County Board, regarding groundwater policies and programs, and is responsible for many of the educational initiatives currently underway in the County.

5.2.1 County Regulation

The County Zoning Ordinance covers the unincorporated Towns, except for Pine Grove (no zoning) and Grant (Town zoning), applying land use regulations to assure that construction occurs within a zoning district that allows (as much as possible) for compatible land uses. Much of the County is zoned General Agricultural, which district allows most activities associated with agriculture and rural residential development, provided lot size is appropriate to the Town zoning map, based on the Town land use plan. The minimum residential lot size is generally two acres, to prevent wells from being located too near the POWTS, and to provide for sufficient lot area to dilute groundwater contamination from the POWTS. Commercial and industrial uses (nonfarm and nonresidential) may be allowed as a special exception, with conditions set by the Board of Adjustment. Exclusive Agricultural (minimum lot size of 35 acres per residence, and allows only limited nonfarm residences on existing large lots), and Primary Agricultural (20 acres minimum) Zoning, designed to preserve large blocks of productive farmland, and to minimize conflicts between agriculture and rural residential development, are not present in all Towns. Agricultural Transition (10 acres minimum) and Low Density Agricultural (5 acres minimum) Zoning, are designed to preserve the rural character of outlying areas of the County, especially in areas identified in the local Town Land Use Plan.

For political and economic reasons, it is very difficult to isolate new, rural residential development, with expectations of obtaining safe drinking water from a well, from agriculture, which uses pesticides and fertilizers (with associated leaching) to produce food crops. Given that nonfarm, rural residents make up eighty percent of the rural population, this type of isolation may be unrealistic. Because of groundwater flow paths up to several miles, and Portage County's history of agriculture, a well installed in most areas of the County will produce drinking water that has been affected, to some extent, by agricultural contaminants. Areas downgradient from intensive, irrigated agriculture will likely show the greatest impacts. No zoning districts have been designed to keep future development out of these downgradient areas, although some of these areas are located in Conservancy Zoning (allowing very limited, low impact uses) to protect natural areas and open spaces.

Rural commercial and industrial development is allowed only in specific areas zoned for these uses. These developments may present greater groundwater threats (certainly less predictable than residential) depending on types of fuels and other chemicals that may be present, and the types of activities carried out. Some of the larger construction will require a special exception hearing by the Board of Adjustment, which may set groundwater protection criteria as conditions of approval. The Zoning Administrator and Assistant Zoning Administrator also provide regular checks of properties with high likelihood of groundwater contamination, such as auto salvage yards and other recycling operations, especially in conjunction with the County Board of Adjustment.

The County Wellhead Protection Ordinance (WHPO) is a special overlay district in the Zoning Ordinance, and applies groundwater protection regulations in the portions, located in the unincorporated areas, of the recharge areas of municipal wells (and industrial wells in municipal well fields). As with most new ordinances, when it was enacted in 1993, the WHPO inherited certain land uses that would not be allowed for new construction. The WHPO allows for upgrading of the groundwater protection equipment, rather than retaining deteriorating equipment, of these otherwise non-conforming uses. This provision has been used for two gas stations in the City of Stevens Point recharge area. The WHPO (see APPENDIX WHPO) prohibits unsewered development in Zone A (one year time of travel), and prohibits certain other uses such as gas stations and hazardous chemicals in Zone B (five year time of travel) based on past groundwater pollution experience. Other uses in Zones B and C will require additional scrutiny, and perhaps special exception hearings to set groundwater protection conditions, such as secondary containment for fuel tanks, and stormwater management.

The County Subdivision Ordinance applies to lots (fifteen acres or smaller) created in the unincorporated areas of the County, and has specific provisions for considering groundwater quality as one of the criteria

for deciding whether to approve the land division. The existing County GIS water quality databases are consulted, and, if existing wells in the area immediately surrounding the proposed lot have shown acceptable **(not exceeding any health standards, except nitrate-nitrogen)** water quality, the lot split is not held up due to water quality concerns. If the data is incomplete or not sufficiently current, water tests from surrounding wells are taken by the County Water Quality Specialist at the expense of the subdivider. In the case of a proposed lot split in an atrazine moratorium area (known atrazine contamination above the health standard), the developer was required to install a well, and obtain a water sample that met health standards, prior to approval of the lot split.

If the groundwater is not suitable for human consumption, the proposed lot split will not be approved. Use of a treatment unit, such as reverse osmosis, to remove contaminants to a safe level, will not allow an otherwise unsuitable lot to be approved. Occasionally it is possible to obtain a safe water supply from a different part (isolated vertically from the contamination) of the aquifer, and thus prove the lot suitable.

Generally, samples taken under this provision have been analyzed for bacteria, nitrate nitrogen, pH, conductivity, chloride, alkalinity, hardness, corrosivity, and triazine at the Environmental Task Force Lab at UWSP. Pesticide scans have only occasionally been run due to the higher expense. However, as our data of pesticide levels obtained in the 1990ôs may soon be too old to be usable, the higher cost analyses may be needed. Because the County does not have any data on locations of use of specific pesticides, general scans will be needed, including pesticides which may never have been used in a specific area.

The County Private Sewage System Ordinance regulates private onsite wastewater treatment systems (POWTS), and alternatives for waste disposal (such as privies and self contained toilets) in all areas of the County, both unincorporated and incorporated, where municipal sewer service is not provided. This is an area of primary importance in groundwater protection. County Onsite Waste Specialists verify soil tests submitted by certified soil testers to make certain that the proposed POWTS (new or replacement) is appropriate to the site. They review the plans submitted with a sanitary permit application, and issue the permit, if approvable. They inspect the construction of the POWTS during installation for code compliance. A sanitary permit is required for proposed construction before a building (or zoning) permit can be issued.

In addition to these duties, verifications of proper POWTS maintenance by property owners are required on a regular basis. Lack of proper maintenance of POWTS and sewage holding tanks, can result in system failures and serious health hazards, and follow-up enforcement can be initiated to prevent human exposure to contaminants. Failing POWTS and improper holding tank maintenance, have been implicated in hospitalization of children during diarrhea epidemics in western Portage County, and in Wood and Marathon Counties, according to Marshfield Clinic researcher Mark Borchardt. Many of the older POWTS, presumed to be failing, (Figure 5.3) are in soil similar to those in Borchardtôs study.

The County Animal Waste Storage Ordinance regulates manure storage and utilization Countywide. This ordinance is administered by Land Conservation Division staff. Groundwater and surface water contamination from improper manure management can be quite serious. Even proper application of animal waste, according to a nutrient management plan, can result in some nitrate nitrogen groundwater contamination. (Also see Section 3.3)

The County Human Health Hazard Ordinance has been applied by the Environmental Health Supervisor in situations where groundwater contamination, due to an unused well, was threatening other wells in the area. The County Health Officer has the authority to utilize this ordinance for serious groundwater contamination incidents.

The County Health and Human Services Department contracts with DNR to sample and inspect some public (non-municipal) water supplies in rural Portage County. Many of these wells have been upgraded as a result of this local oversight.

The County Solid Waste Department manages the County landfill and recycling programs. Disposal of garbage, in a properly managed facility, is a primary groundwater protection tool.

The County Emergency Management Department (EMD) maintains lists of facilities, housing large quantities of hazardous materials, and contingency plans for potential emergencies involving environmental releases. The EMD is also involved in providing for prompt cleanup of spills of hazardous materials, in conjunction with the County Hazardous Materials (HAZMAT) Team.

5.2.2 Local Government Regulation

Local governments, with public water supplies, provide groundwater management within their municipal boundaries in the areas of wellhead protection. Most of the municipal WHPOõs are quite similar to the County WHPO, providing for fairly equivalent groundwater protection, regardless of location of the municipal boundary. These municipalities have well abandonment programs for abandonment of unused or potentially unsafe wells. The County does not currently provide this equivalent protection to unincorporated areas, though it is recommended in this document.

Other local regulation is in the area of installation and removal of fuel and hazardous liquid storage tanks conducted through the Fire Departments. Annual inspections of some commercial and industrial facilities with potentially hazardous chemicals on site, are also conducted by Fire Department personnel.

5.2.3 Political And Educational Institutions

The County Board of Supervisors ultimately decides what role the County will play in groundwater management, but does not do so without a significant amount of advice and information. The Groundwater Citizens Advisory Committee (GCAC) was created following adoption of the Groundwater Management Plan in 1988, and is made up of citizen members from each of the municipalities (though some seats are currently vacant). Due to the importance of this advisory role, members are appointed by their Town or Village Boards or City Council, and approved by the County Board.

The **Groundwater Citizens Advisory Committee's** mission is to gather views and concerns, regarding groundwater protection and management in Portage County, from individual citizens and municipal governing boards, and to present recommendations to the Planning and Zoning Committee for consideration by the Portage County Board. To accomplish this goal, the following objectives were identified:

- Develop a plan for protection and management of groundwater
- Develop strategies for implementing a groundwater plan that protects the health of all citizens
- Seek funding and staff support to aid in implementing recommendations
- Identify research and education needs
- Provide for public input
- Provide a framework for County actions

Membership on the GCAC consists of one representative from each of the 28 municipalities in Portage County. Since some municipalities decline participation or lack a representative, current membership consists of 20 individuals. Elected officials are ineligible for committee membership. GCAC generally meets six times per year, but special meetings have been called to deal with specific issues.

GCAC has formed three Subcommittees to carry out specific portions of its mission ï Public Involvement and Education, Groundwater Management Planning and Implementation, and Continual Assessment. Membership on the Subcommittees is open to any interested individual, although the Subcommittee chairs must be GCAC members.

The Public Involvement and Education Subcommittee (PIE) mission is to provide access to groundwater information, and a platform for public involvement in groundwater management decision-

making. This Subcommittee has been responsible for a wide variety of educational and outreach activities such as:

- Sponsored and helped develop the Portage County Value of Groundwater Survey (1997)
- Commissioned the report ñPortage County Groundwater Conditionsò (Kraft and Mechenich 2000)
- Developed a slide presentation to inform civic organizations and elected municipal boards regarding the challenges for groundwater contained in the report. (2001)
- Collated existing groundwater publications for donation to area libraries (2002)
- Helped develop the Portage County Groundwater Website (2001)

Portage County UW Extension staff continually assists in PIE educational and outreach activities.

The Groundwater Management Planning and Implementation (GMPI) Subcommittee mission is to author, update, and implement the Groundwater Management Plan for Portage County. The Subcommittee has been involved in every step of the process of developing this Plan. On a continuing basis, this Subcommittee:

- Sets and revises groundwater management goals
- Develops and revises strategies to achieve those goals
- Assesses and reports on progress towards those goals.

In addition, the GMPI Subcommittee will prepare an annual progress report, to serve as the revisions and updates to the Groundwater Management Plan. This report will be presented to the Portage County Planning and Zoning Committee and the County Board, sharing the latest condition and prognosis of our groundwater.

The **Continual Assessment Subcommittee (CAS)** mission is to design and implement a long-term monitoring and assessment plan for groundwater quality and quantity for Portage County. This subcommittee will play a critical role in determining whether the County groundwater management goals and strategies are having their desired effect. Existing databases will be utilized to identify data strengths and weaknesses. In addition, the CAS will choose select monitoring points around the County (private and municipal wells, as well as surface water bodies) for long-term monitoring.

The **Portage County Groundwater Guardians** formed in 2001 as an offshoot of the PIE Subcommittee. Its mission is to educate Portage County citizens regarding groundwater protection. It has supplied County schools with educational videos and associated curriculum, and interested volunteers teach hands-on lessons in County elementary, middle, and junior high schools.

SECTION 6.0 RECOMMENDATIONS

The citizens of Portage County are highly dependent on groundwater for drinking, municipal, industrial, agricultural, and other uses. So too are the County's streams, lakes, wetlands, and aquatic plant and animal communities. Our groundwater is owned by all of us in a public trust. **While no one has a right to contaminate the groundwater, it is recognized that some contamination comes from most land use activities.** Along with the rights of ownership, go the responsibilities for stewardship, and for passing the resource on to future generations. Three critical groundwater challenges have been identified by the Groundwater Citizens Advisory Committee (GCAC) - groundwater quantity, nitrate pollution, and pesticide pollution ï as priorities for future action.

GCAC has developed the following recommendations, for goals for groundwater quantity and quality, based on existing health standards, and desired drinking water and environmental conditions. Some of the goals, such as "Determine what pesticides are being used and where.", reflect our current lack of knowledge. Others, such as the quantity goals, are based on perceived needs of the citizens of Portage County and our environment. Once adopted, these goals can serve as the base for groundwater programs in Portage County for the foreseeable future.

Each of the recommended strategies is designed to achieve progress toward one of the goals. These strategies are by no means all of the ways in which the goals can be achieved, but represent a good starting point for moving forward in groundwater protection in Portage County. In order to implement each of the strategies, an advisory group of stakeholders will be needed to achieve the best result, with minimal waste of time, funds, and energy. The strategies are necessarily general in nature, in order to provide flexibility in implementation. A great deal of public and private sector interaction and collaboration will be necessary to achieve progress in these areas. It will be essential to avoid polarization, realizing that we are working toward our common goal of adequate quantities of clean groundwater, and recognizing the needs of each constituent group, if we are to be successful.

Comments received during the public hearing process recommend development of a complete inventory of past research regarding groundwater in Portage County. An analysis of the economic cost of groundwater contamination to the residents of Portage County should be conducted. Also critical to this effort are development of detailed workplans for the individual Strategies, including identification of funding mechanisms. The health of County residents must continue to be central to any future groundwater programming.

SECTION 6.1 GOALS

The approach chosen for planning the future of Portage County groundwater is somewhat different than past groundwater protection efforts. The emphasis of these revisions is to establish goals regarding available quantities of groundwater for all uses, and water quality goals for levels of contamination from pesticides and nitrate-nitrogen. The water quality goals are based on State adopted Public Health Standards listed in APPENDIX PH. Pesticide goals reflect research documenting health effects at levels significantly below the Enforcement Standard.

Pesticides Goals:

1. Determine what pesticides are being used and where. Target the above areas and sample wells for possible detection of these pesticides **and their metabolites**.

2. For pesticides with established groundwater standards:

   a. In areas where pesticide concentrations in groundwater are below the Preventative Action Limit (PAL), pesticide concentrations should be maintained below the PAL.

   b. In areas where pesticide concentrations in groundwater are at or over the PAL, pesticide concentrations should be lowered to below the PAL.

   c. In all cases where multiple pesticides are present below their individual enforcement standards in groundwater, the sum of all pesticide residues **(including metabolites)** should not exceed the most stringent enforcement standard for any of the individual pesticides detected.

3. For pesticides without groundwater standards:

   a. In areas where these pesticides are detected in groundwater, levels should be maintained or lowered to levels below the PAL established for pesticides **(of similar toxicities and modes of action) with established** groundwater standards.

   b. In all cases where multiple pesticides are present in groundwater, the sum of all pesticide residues should not exceed the most stringent enforcement standard established for pesticides **(of similar toxicities and modes of action)** having **established** groundwater standards.

Nitrate Goals:

1. In areas where groundwater nitrate is:

   a. below the health standard (10 ppm nitrate nitrogen), nitrate concentrations should be maintained or lowered.

   b. at or over the health standard, nitrate concentrations should be reduced to below the enforcement standard.

2. In areas where nitrate concentrations are below the health standard, but cause negative environmental impacts, measures should be taken to reduce nitrate levels.

Quantity Goals:

1. Avoid **significant** human-influenced depletion of the County's lakes, streams, wetlands, and groundwater reserves.

2. Identify areas within the County that may have groundwater shortages now or in the future.

SECTION 6.2 STRATEGIES

In order to achieve the Goals set forth in the previous section, specific strategies have been discussed and developed. These methods for meeting the Goals are by no means the only ones that have been (or can be) considered. The Strategies are in no particular order, but will be prioritized based on public input. Based on annual evaluation of results of future County groundwater program activities, other strategies will likely be added, and perhaps some deleted, in the future. Each of these items will be further developed, by a team including stakeholders from the public and private sectors, with a specific plan of work, including anticipated staffing requirements, and will be submitted for consideration by the Planning and Zoning Committee of the County Board of Supervisors.

Continue Current County Programs Which Affect Or Improve Groundwater

Current groundwater programs, and the County agency currently responsible for their administration, are listed below, along with a brief description of each program. Many current groundwater programs were established as a result of the adoption of the Groundwater Management Plan in 1988

Administered by the PLANNING AND ZONING DEPARTMENT

Private onsite wastewater treatment systems: Residences and businesses not served by municipal sewer require private onsite wastewater treatment systems (POWTS) to properly treat sewage, removing disease-causing bacteria and viruses, before the sewage reenters the groundwater. County staff reviews soil test reports prepared by State certified soil testers, and verify soils on individual sites. County staff also reviews plans for proposed POWTS to make certain that the plans are code compliant, and issue sanitary permits based on the soil test and plans submitted. They inspect POWTS during construction to assure proper installation; County staff also investigates complaints of failing POWTS (formerly referred to as septic systems) and assists property owners in replacing or rehabilitating these failing systems. The Wisconsin Fund Grant program can pay a portion of the cost of a replacement system.

Drinking water quality for new residences: Prior to approving a proposed survey to create a new residential lot in the unincorporated areas of the County, groundwater quality in the surrounding area is reviewed to determine whether a well on the proposed lot is likely to produce good quality drinking water. Based on information regarding depths and corresponding water quality in nearby wells, the new well can be constructed to assure the best quality water for the proposed residence. If the County does not have sufficient (or sufficiently recent) data on record, the developer of the proposed lot is required to provide funding for water tests from nearby wells prior to approval of the survey.

Assist the public with water quality information**: People considering buying property in a given area of the County are often curious regarding the quality of drinking water they can expect. Information regarding the risks associated with pollutants present in a given well is also discussed. Recommendations for specific water sample analyses to obtain additional information are provided.**

Maintain and improve County and State groundwater databases: Over the past fifty years, extensive water sampling has been conducted in Portage County, for a wide variety of purposes, and by a wide variety of investigators. Taken together, these records can provide a good picture of current groundwater quality, and trends in groundwater quality and quantity over time. In order to make these records most useful, each sample result needs to be correlated to the specific well from which it was obtained. Ownership and location information submitted with many samples is not sufficient to determine which well was sampled, and the results are not highly useful. In addition, the information provided by property owners may conflict with that provided previously. It is often necessary to interpret the data in order to assure that decisions, by property owners and by local and State officials, are made based only on accurate information**. Integration of the databases maintained by Portage County, DATCP, DNR (Groundwater Retrieval Network), and the UWSP Environmental Task Force Lab (now known as the Water and Environmental Analysis Lab) will be completed during 2004.**

Conduct drinking water education programs for communities: Each year a specific area of the County is targeted for an educational program regarding groundwater quality. This effort usually involves providing information to area residents regarding local water quality, assisting them in getting their drinking water samples analyzed, and conducting a community meeting to interpret sample results and answer questions. This approach makes it much more convenient for people to obtain groundwater quality information critical to their health and wellbeing.

Implement County Groundwater Management Plan Recommendations: Provide groundwater information to County, local, and State officials regarding ordinances and codes designed to meet established water quality standards, and recommend changes where necessary.

Wellhead Protection Ordinance: Assure compliance with the County Wellhead Protection Ordinance, in unincorporated areas of the County that are within municipal well recharge areas.

Known Well Construction

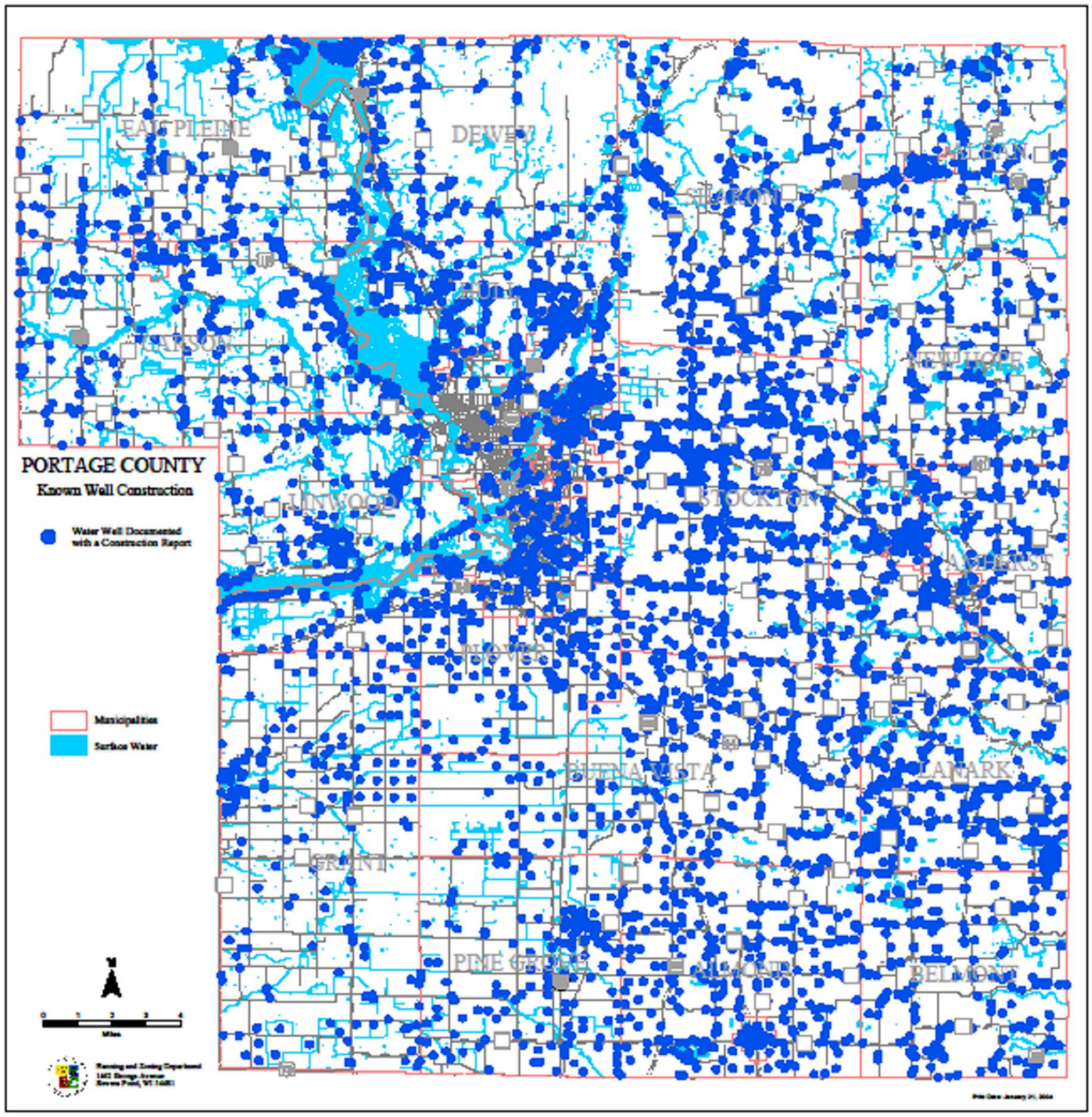


Figure 6.1

Administered by the HEALTH AND HUMAN SERVICES DEPARTMENT

Advise citizens regarding water quality health concerns: People whose water samples contain unsafe levels of contaminants can receive health-related information from Environmental Health Section staff. This information is commonly provided to rural Portage County residents whose well water samples are found to be bacteriologically unsafe or those served by the Women and Infant Children program.

Private well inspections (unsafe samples): Upon obtaining a bacteriologically unsafe water sample result, a property owner is usually directed to resample (carefully following proper sample directions) to eliminate a false positive result. If the sample comes back positive for bacteria following the second sample, an environmental health sanitarian will inspect the well to determine the likely reason that bacteria are present in the well, advise the property owner regarding disinfection (chlorination), and if necessary, well repair or replacement.

Transient Noncommunity Public Water Systems: The County contracts with the Department of Natural Resources (DNR) to annually sample and inspect the private water supply systems providing drinking water for establishments that serve the public. These include restaurants, taverns, hotels, motels, bed and breakfasts, churches, campgrounds, recreational and educational camps, and grocery stores.

Waterborne Illness Investigations: Suspected cases of waterborne illness are investigated to determine the likely cause and to recommend necessary corrective actions to prevent future incidents. Waterborne illnesses include gastrointestinal (vomiting, diarrhea) problems, infant methemoglobinemia, and headaches that can be caused by a number of microbial or chemical contaminants. Victims of waterborne illnesses often require hospitalization or other medical treatment.

Water Quality Partnership with Central Wisconsin Groundwater Center and Environmental Task Force (ETF) Lab: Drinking water samples obtained by Environmental Health staff are submitted to the ETF lab for analysis. A partnership has been established with the Central Wisconsin Groundwater Center (now known as the Center for Watershed Science and Education) for addressing health-related groundwater problems in the County.

Healthy People Portage County – Environmental Health Implementation Team: A multifaceted initiative to address health issues and promote health to the citizenry of Portage County has a team specifically focused on the issues of food safety, air quality, and drinking water quality. The drinking water goal is: to prevent people from drinking water of unsafe or unknown quality.

Determine Areas With High Nitrate And Pesticide Levels

This will be accomplished utilizing the County Geographic Information System (GIS) using water sample information currently in the County database, and future information obtained from other sources. All available data sources will be used to further develop a unified County water quality database. Some of the data has incorrect locational information and cannot be added to the database without investigation and correction.

Sources of information include the Wisconsin Department of Agriculture Trade and Consumer Protection (DATCP), the Central Wisconsin Groundwater Center (now known as the Center for Watershed Science and Education), the Wisconsin Department of Natural Resources (DNR), and the Portage County Environmental Health Lab (closed January 2002). While much of the information is in computer databases, some data is available only on paper and will need to be entered into the County database in order to be useful. The computerized data exists in different formats and must often be converted or otherwise modified before it can be added to the County database.

Based on this information, ongoing monitoring for nitrates, and individual pesticides of highest concern, can be prioritized to the areas with the greatest known or potential problems.

Establish Well Abandonment Program In Portage County

Unused wells are a great threat for contamination of drinking water since they can provide a direct route to the groundwater for any pollutants on or near the ground surface. Currently, DNR administers the well abandonment program. It does not have enough staff to follow up on proper abandonment of unused wells, and has offered to allow counties to administer this program as delegates of the State. Portage County proposes to pass an ordinance vesting authority for **(co-administration of)** this program in the Planning and Zoning Department, and Health and Human Services-Environmental Health Section. The proposed ordinance is located in Appendix WA of this document. It will complement existing ordinances in communities with municipal water supplies.

Ongoing Public Education

Groundwater education in Portage County is conducted in a number of ways in a variety of settings. Despite a local sensitivity to groundwater issues developed over the past thirty years, the need exists for continued groundwater education for children and adults. This has been accomplished through the environmental education curriculum in our schools, presentations to community groups, issue-specific education of property owners, and media coverage of groundwater news.

Recently added to these traditional methods of information dissemination, are the Portage County Groundwater Website (www.uwsp.edu/water/portage) and the Portage County Groundwater Guardians. The website has a variety of information specific to Portage County and a multitude of links to other groundwater related internet sites. The Groundwater Guardian team is comprised of local citizens (with representatives from agriculture, business, education, and government) who have provided water related videotapes to County schools, and coordinated volunteer groundwater lessons for County elementary school children.

In addition to general groundwater education programs, specific programs are under development with the assistance of UW Extension to:
Educate Rural and Urban Homeowners Concerning the Impacts on Groundwater of Septic Systems, and Lawn and Garden Fertilizers and Pesticides, and,
Educate Operators of Businesses and Institutions Regarding Groundwater Impacts from Landscape Practices and Chemical Storage and Use.

Develop A Portage County Agricultural Pesticide Reporting Database

It is known that certain pesticides currently or historically used in Portage County leach to groundwater, especially in areas of sandy soils. It is very expensive to analyze groundwater samples for pesticides. It is not economically feasible, nor a wise use of sampling funds, to analyze routinely for pesticides. Licensed pesticide applicators are required to keep records of locations and application rates of restricted use pesticides. Currently, this information is only available to DATCP, if agency staff chooses to request the information. If the dates, locations of use, and application rates of each pesticide were available to Portage County staff, it would be possible to decide likely locations to sample for individual pesticides used in these areas.

Determine Recharge Rates And Water Budgets For All Of The County's Aquifers

It will be possible to properly understand land use impacts, regarding groundwater quantity and stream baseflow, in Portage County, only if the water budgets (infiltration vs. withdrawal) for each of the County's aquifers are well understood. This understanding is necessary in order to provide adequate groundwater resources for all non-consumptive (environmental, recreational, etc.), as well as consumptive uses of our groundwater. This will be accomplished using the County Geographic Information System (GIS), and will utilize well construction reports, as well as published documents regarding bedrock type and depth. This effort will complement the high capacity well legislation currently working its way through the State legislative process.

Develop Collaborative Partnerships Between Portage County Agencies

The Planning and Zoning Department (P&Z) was named the lead agency in the County for groundwater programming under the Groundwater Management Plan (1988). In reality, P&Z staff has worked closely with the Environmental Health Section (EHS) on health-related groundwater issues. EHS obtained a grant to help develop health-related content for the Groundwater Website, contracts with DNR for sampling and inspection of noncommunity public wells, and counsels citizens with known drinking water contamination. In addition, P&Z and EHS are currently developing the proposed well abandonment program. Specific groundwater improvement goals are part of the P&Z Land Conservation Section's Land and Water Resource Management Plan (September 1999) and complement the Strategies in this document.

Further partnerships will be developed with other organizations and agencies (Golden Sands RC & D, UW Extension, Plover River Alliance, environmental groups, business, and agriculture trade groups) concerned with groundwater related environmental protection.

Negotiate With Corporate Food Processors Regarding Pesticides And Nutrients Required For Grower Contracts

Farmers who grow vegetable crops intended for sale to the area corporate food processors (e.g. Del Monte, McCain, etc.) are required by contract to grow these crops under specific conditions. Often these conditions require nutrient and pesticide applications that can result in leaching of chemicals to groundwater. Negotiations with processors may be able to lessen these requirements, resulting in decreased potential for groundwater contamination. A substantial amount of the land in the recharge areas for the Stevens Point, Whiting, and Plover municipal wells is used for vegetable production. Most of the land used for vegetable production outside these municipal well recharge areas contains drinking water wells for hundreds of rural families.

Support Statewide Pesticide Reporting Database

Support a Statewide Pesticide Reporting Database: Current legislation has established a limited program in DATCP to study the feasibility of a Statewide pesticide reporting database. If Portage County wants to see a Statewide pesticide reporting database established, we need to be at least as active in our support as some other interests are in their opposition.

Encourage Organic And Sustainable Agriculture

It has been demonstrated that organic farming, **recognized under the Federal National Organic Program and by the National Organic Standards Board,** which eliminates the use of pesticides, has lower groundwater impacts than current mainstream agricultural practices. While the knowledge of organic farming practices is available, we need to actively promote the use of these techniques as a means to protect and improve groundwater. This will involve UW-Extension staff.

Sustainable agriculture is understood to mean **a system of agricultural production that supplies the necessities of the present without compromising or polluting the resources of the future,** thereby growing crops and livestock profitably without undue deterioration of the environment.

Court Businesses That Can Utilize Groundwater Friendly Crops

Some crops can be grown profitably with little or no impact to groundwater. Specifically, legumes (alfalfa and soybeans) are commonly grown in many areas for livestock feed and other uses. Whether farmers will grow these crops locally depends on economic return and availability of stable markets. Portage County farmers, who could produce these crops, without contaminating the groundwater, should be brought together with the businesses that use these groundwater friendly crops. We need to identify these businesses, and determine what is needed to bring them together with the farmers.

Golden Sands RC&D recently completed a study investigating groundwater friendly crops (APPENDIX AD) that can be grown in central Wisconsin and likely uses for them. The Village of Plover explored establishment of a committee to develop ways to get farmers in its municipal well recharge area to grow groundwater friendly crops to reduce the cost of treating its drinking water in the future.

Negotiate Conservation Easements - Buy Land

This strategy would allow land in well recharge areas to remain in private ownership, but the property owners would be paid to allow only groundwater friendly land use practices. For instance, a farmer would agree to only plant crops that could be grown without the use of pesticides or fertilizers, which could leach to groundwater. In return, the farmer would be paid an easement fee of the difference between the value of the crop produced and the value of another crop that could have been grown had pesticides or fertilizers been used.

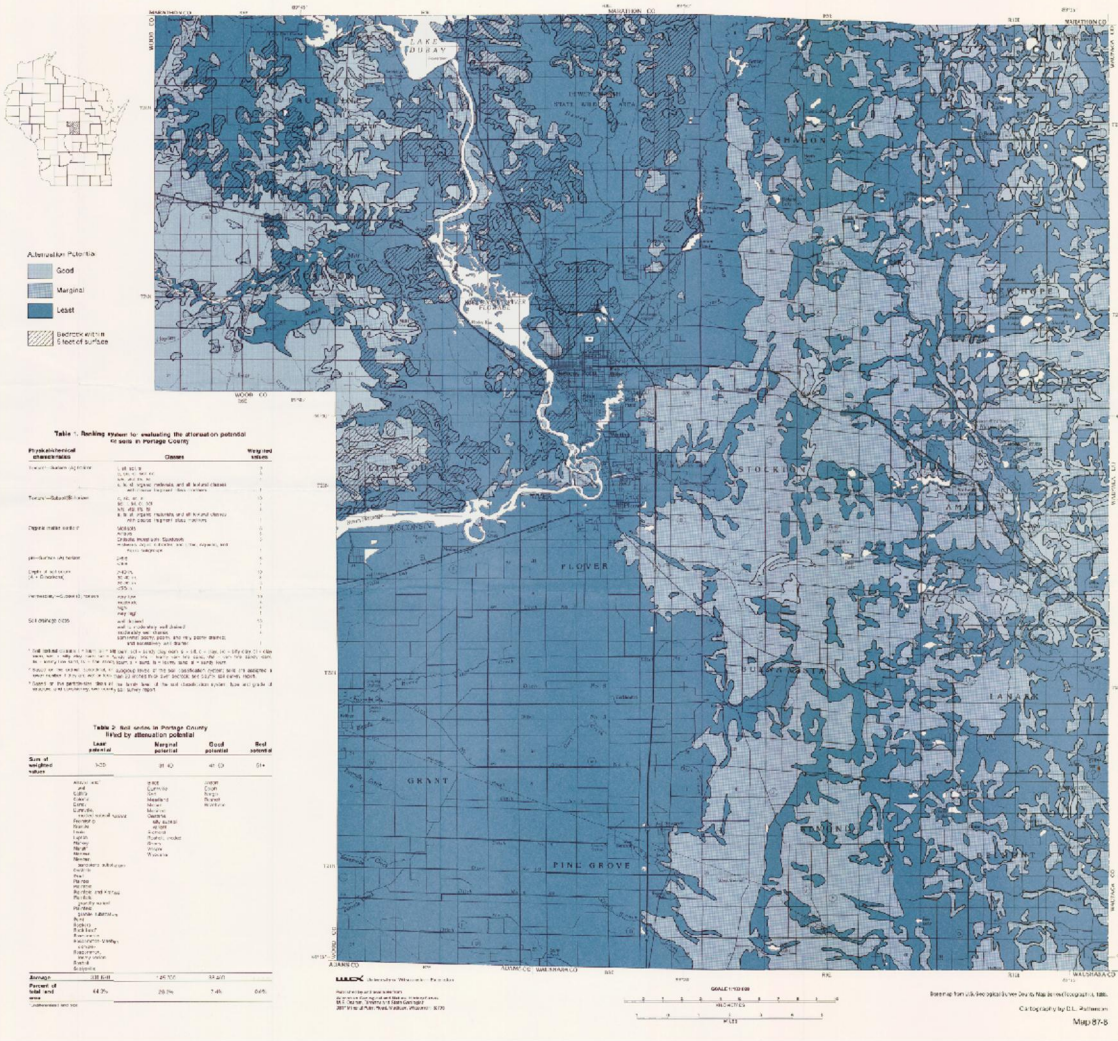
Conservation easements have been widely used. Use of conservation easements is consistent with recommendations of the Land and Water Resource Management Plan and Open Space Plan adopted in 1999 and 2000, respectively. Excerpts from the Open Space Plan can be found in Appendix CE.

Land in well recharge areas could be purchased by government or land trusts, and be put in a land use that would not contaminate groundwater. **In the short term,** this approach is potentially much more expensive than conservation easements, **but may ultimately be more cost effective.** This has been used in Stevens Point and Whiting, with the land maintained as open space or added to the municipal park systems. Municipal well recharge areas are broken down into zones based on potential for contamination of the wells. Land in zones nearest the wells will be highest priority for purchase or conservation easements.

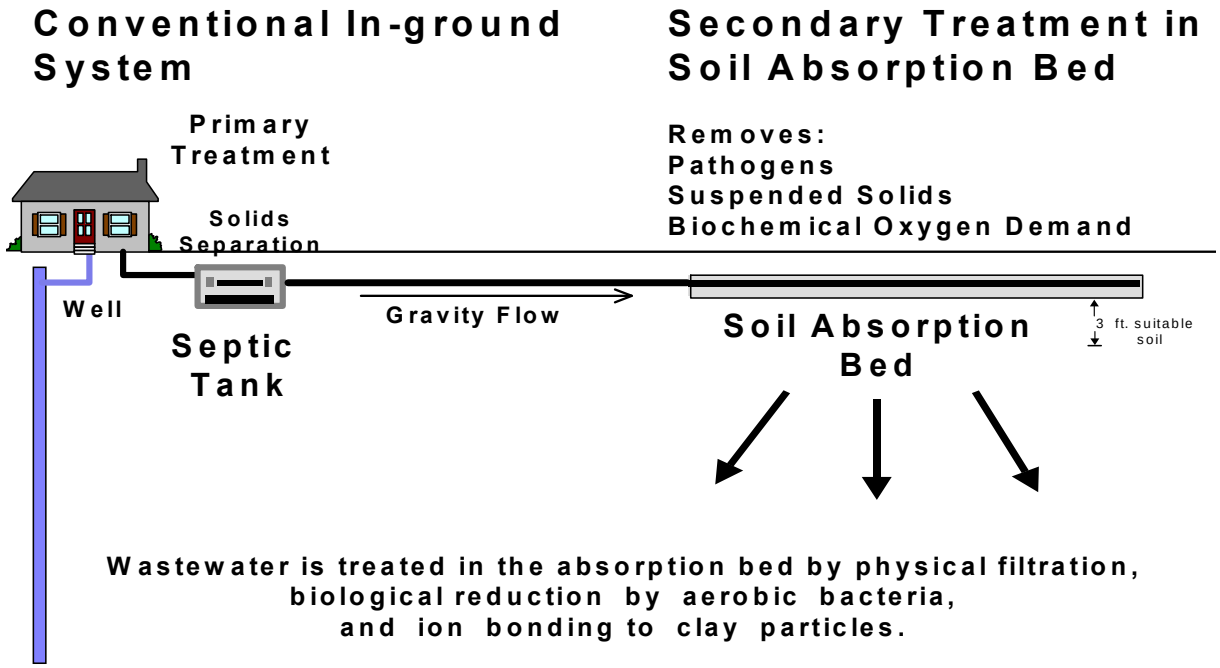
SOILS OF PORTAGE COUNTY AND THEIR ABILITY TO ATTENUATE CONTAMINANTS

L. Ward Good and F.W. Madison

1987



APPENDIX PS



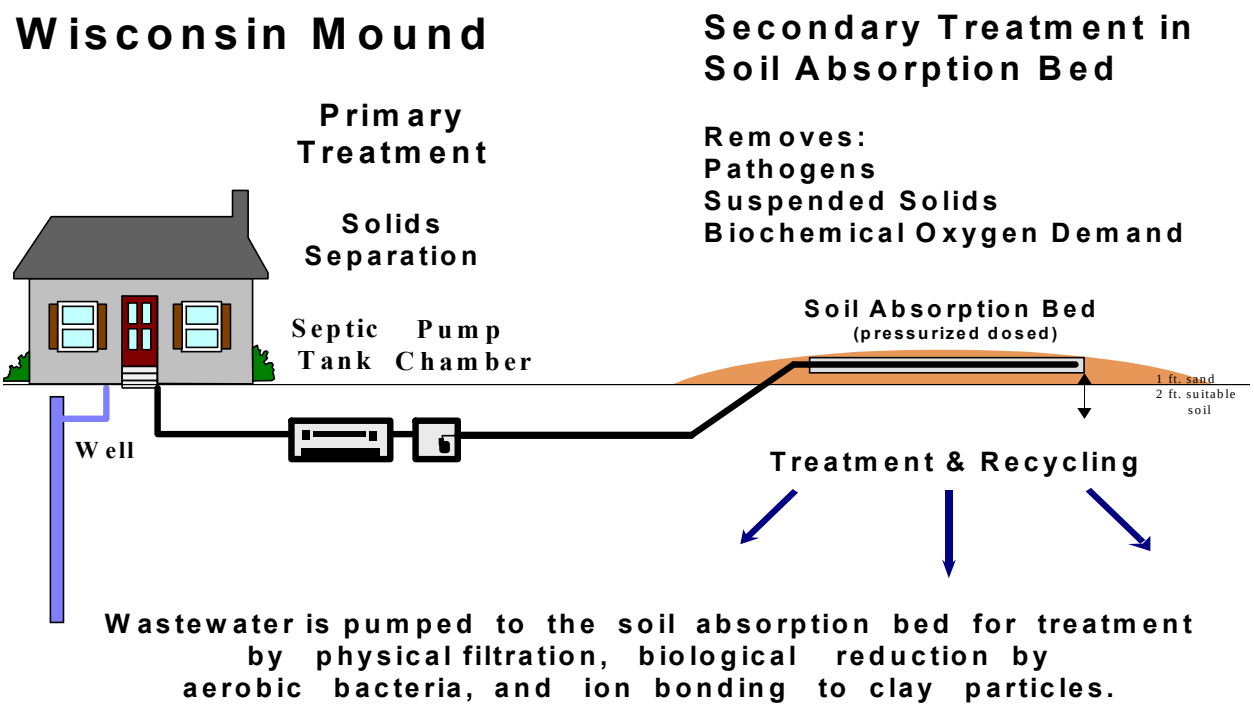
A conventional in-ground septic system consists of a septic tank and a subsurface soil absorption bed. In the septic tank, solids settle out of the waste stream and anaerobic bacteria facilitate the partial breakdown of organic matter (primary treatment). Clarified effluent from the septic tank discharges via gravity to a soil absorption bed.

The soil absorption bed removes pathogens, organic matter, and suspended solids from the septic tank effluent via physical filtration, biological reduction of contaminants by aerobic microorganisms, and ion bonding to negatively charged clay particles. The soil serves as a fixed porous medium on which beneficial aerobic microorganisms grow. These organisms feed on organic matter present in the wastewater and help eliminate pathogens. Research indicates that 3 feet of suitable soil between the distribution trench and bedrock or high groundwater is sufficient to protect public health and groundwater quality. Because a conventional system includes a gravel distribution trench and overlying fill material, the system requires about 5 feet of suitable native soil.

The conventional system is a passive system that relies on gravity flow. The flow volume entering the septic tank controls the volume discharge to the soil. The discharge enters the distribution pipe via gravity, and usually drains out of the first few holes in the pipe, creating areas of favored distribution. This type of distribution can result in localized clogging along the trench as solids and bacterial biomass accumulates in these areas of preferential flow. The effectiveness of a conventional system depends on the type and permeability of native soils and the slope and drainage pattern of the site. The septic tank requires periodic pumping of accumulated solids, as well as inspection to determine that the tank remains watertight.

The conventional system is typically the least expensive system in use in Wisconsin and it is also the most common. These simple, passive systems that rely solely on unsaturated soil for wastewater treatment have been codified in Wisconsin since 1969 and could be used on 47% of the State's land area. They are also in use in most other states. In Wisconsin, they still constitute approximately 63% of all new systems installed and 57% of all replacements.

Prepared by the State of Wisconsin Department of Commerce, Division of Safety and Buildings. Version date 8/17/99



A mound system, like a conventional system, consists of a septic tank and a soil absorption bed. In the mound system, however, sand is added where suitable native soil is insufficient. Clarified effluent from the septic tank is pumped, in controlled pressurized doses, to an aboveground, free-standing sand layer. The sand layer, placed upon a specially prepared area of native soil, serves as the medium on which aerobic bacteria facilitate much of the secondary treatment.

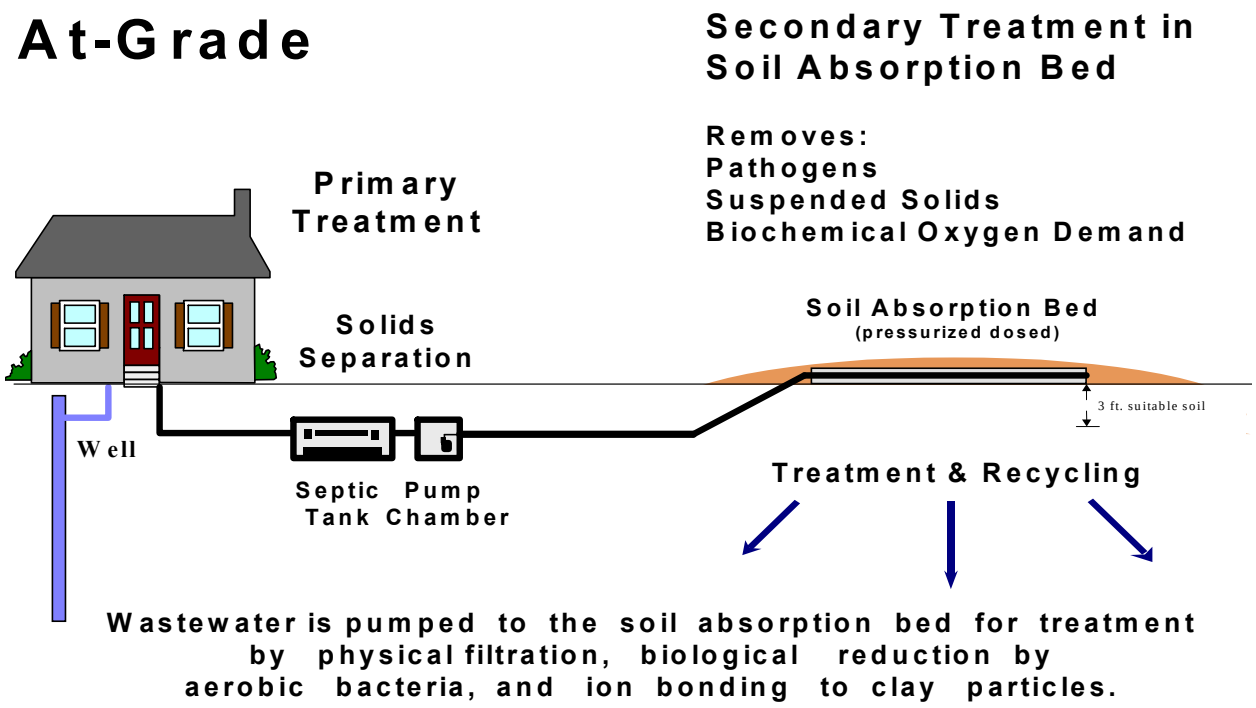
In a mound, the sand layer and native soil combined provide 36 inches of soil depth for treatment. Thus treatment is at least as effective as a conventional system. Delivering effluent to the soil absorption bed in controlled pressurized doses has some additional advantages. Wastewater is equally distributed, which reduces the chances for localized clogging. And the absorption bed has a ñrest periodò between doses that can result in superior pathogen and nutrient removal. Additional research over the past 20 years has provided increasingly effective specifications for mound geometry, sand characteristics, dosing frequencies, and loading rates.

Solids must be periodically pumped from the septic tank, as well as from the pump chamber to insure proper functioning of the pump mechanism. Proper site preparation protocols must be taken to prevent the leakage of effluent at the base of the mound.

The use of sand as a medium for wastewater treatment, rather than native soil, is more than 100 years old. In Wisconsin, beginning in 1971, the legislature funded research intended to provide effective systems for sites where a lack of native soil prohibited a conventional system. The mound system using sand as a medium became available for general use in 1980, but new construction was restricted to sites with 24 inches of native soil. This increased the suitable land area by 10 percentage points. There are no technical or public health reasons for this restriction. The proposed code will allow mound systems on sites with 6

inches of native soil, which will increase the suitable land area by another 25 percentage points. Currently, in Wisconsin, mound systems constitute approximately 20% of all new systems installed and 23% of replacements. These systems are also used in many other states.

Prepared by the State of Wisconsin Department of Commerce, Division of Safety and Buildings. Version date 8/17/99



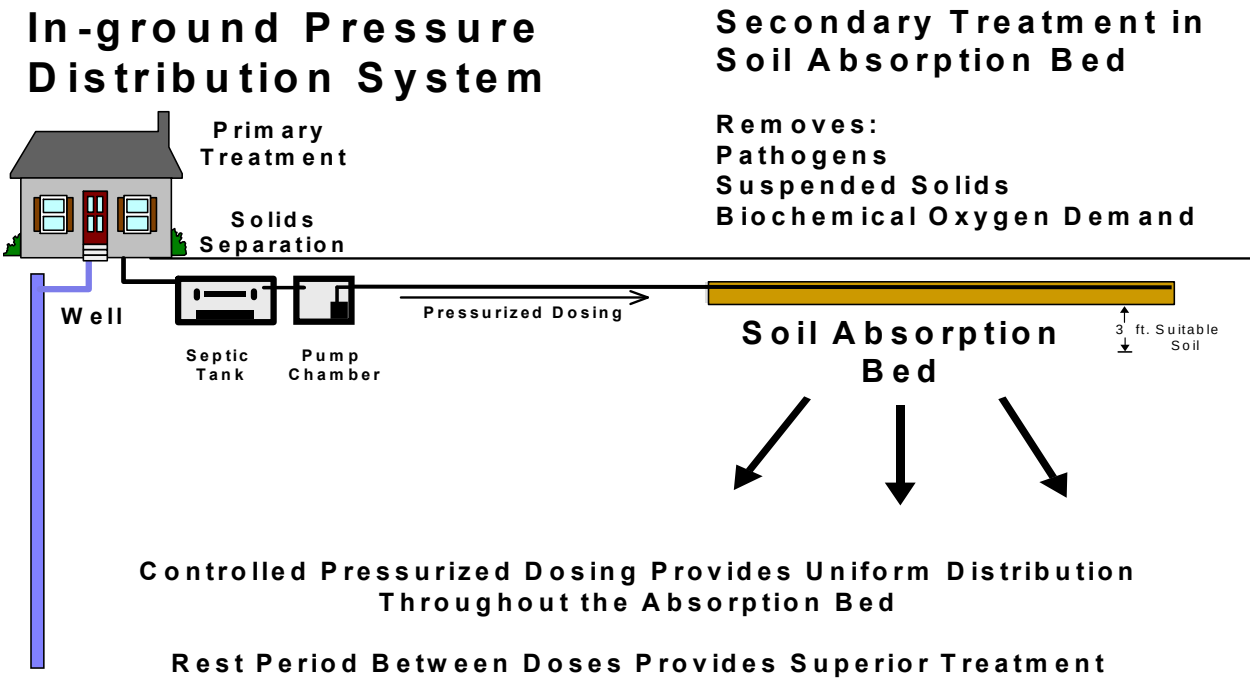
An at-grade system consists of a septic tank, pump chamber, pressure distribution system and a soil absorption bed. In the septic tank, solids settle out of the waste stream and anaerobic bacteria facilitate the partial breakdown of organic matter (primary treatment). Clarified effluent from the septic tank is typically discharged via gravity to a pump chamber from which it is pumped, in controlled pressurized doses, up to the soil absorption bed. At-grades are unique in that the distribution piping is placed on a prepared gravel bed at the ground surface, literally ñat-gradeò. The distribution piping is covered with sand and soil to protect it from freezing.

Because the effluent is pumped upward to be dispersed just below the ground surface, the at-grade can be used on sites with 36 inches of suitable native soil, rather than the 56 inches required for conventional systems (which disperse effluent approximately 20 inches below the surface). And, since the amount of above-ground sand fill needed is less, these systems tend to be less expensive than a traditional mound.

Solids must be periodically pumped from the septic tank, as well as from the pump chamber to insure proper functioning of the pump mechanism. Proper site preparation protocols must be taken to prevent the leakage of effluent at the base.

The at-grade design was developed in Wisconsin about 10 years ago, however, most components from which it is assembled, septic tank, pump and 36" soil absorption bed, have a long history in the State. Under the current code, at-grades are approved as experimental systems. The proposed code will approve them for general use. At-grade systems are estimated to constitute approximately 5% of new systems and 5% of replacements in Wisconsin.

Prepared by the State of Wisconsin Department of Commerce, Division of Safety and Buildings. Version date 8/17/99



An in-ground pressure distribution system consists of a septic tank, pump chamber, and a sub-surface soil absorption bed. Including space for the drain tile, gravel trench and overlying fill, the minimum native soil requirements range from 49 to 53 inches depending on the diameter of the distribution pipes. Like a conventional system, 36 inches of suitable native soil above bedrock or groundwater is required for the absorption bed.

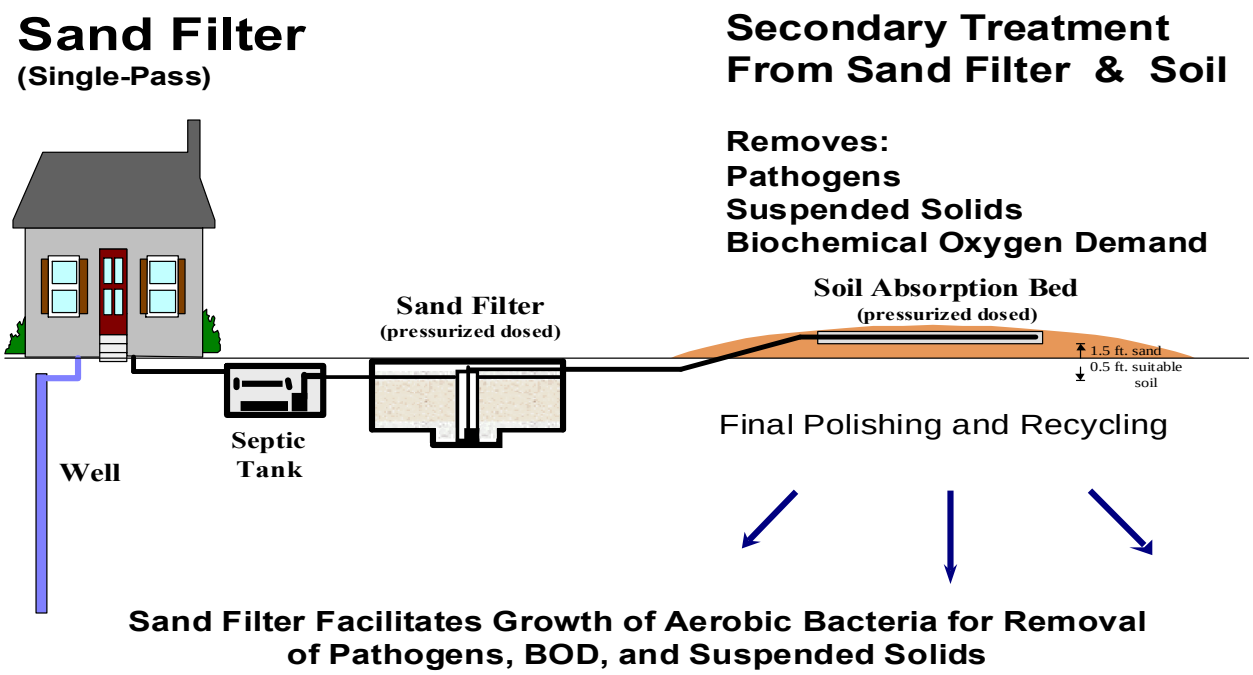
The treatment mechanisms of in-ground pressure distribution systems are very similar to those of conventional systems, that is, 36 inches of native soil constitute a fixed porous medium on which aerobic bacteria provide secondary treatment of wastewater. The principle difference is the addition of a pump chamber that delivers septic tank effluent to the soil absorption bed in controlled timed doses. Delivering septic tank effluent in controlled pressurized doses ensures that the wastewater is equally distributed across the soil absorption bed, thus reducing the potential for the localized clogging that often occurs in conventional gravity dosed systems. Research has also shown that discharging effluent in controlled, properly timed doses gives the absorption bed a drying period between doses that can result in enhanced treatment with regard to pathogen and nutrient removal.

Septic tanks require periodic pumping of accumulated solids, as well as inspection to determine that the tank remains watertight. Solids must also be removed from the pump chamber periodically to insure proper functioning of the pump mechanism.

The components of these systems are not different than those of conventional and mound systems, which have a long history in Wisconsin. They are used under the current code. Their advantage is the potential

of less clogging of the soil absorption bed. In Wisconsin, permits for in-ground pressure distribution systems constitute a very small number of the new systems and replacements--less than one-half of one percent.

Prepared by the State of Wisconsin Department of Commerce, Division of Safety and Buildings. Version date 8/17/99



Further Treatment is Achieved in the Soil Absorption Bed

A single-pass sand filter consists of a septic tank, sand filter and soil absorption bed. In the septic tank, solids settle out of the waste stream and anaerobic bacteria facilitate the partial breakdown of organic matter (primary treatment). Pressured doses of clarified effluent from the septic tank are discharged to the sand filter. The sand filter, commonly referred to as a ñmound in a boxò, is a buried chamber containing at least 24 inches of sand between layers of gravel. It serves as the fixed porous medium on which aerobic bacteria provide much of the secondary treatment. The effluent from the sand filter is then discharged, in pressurized doses, to a soil absorption bed.

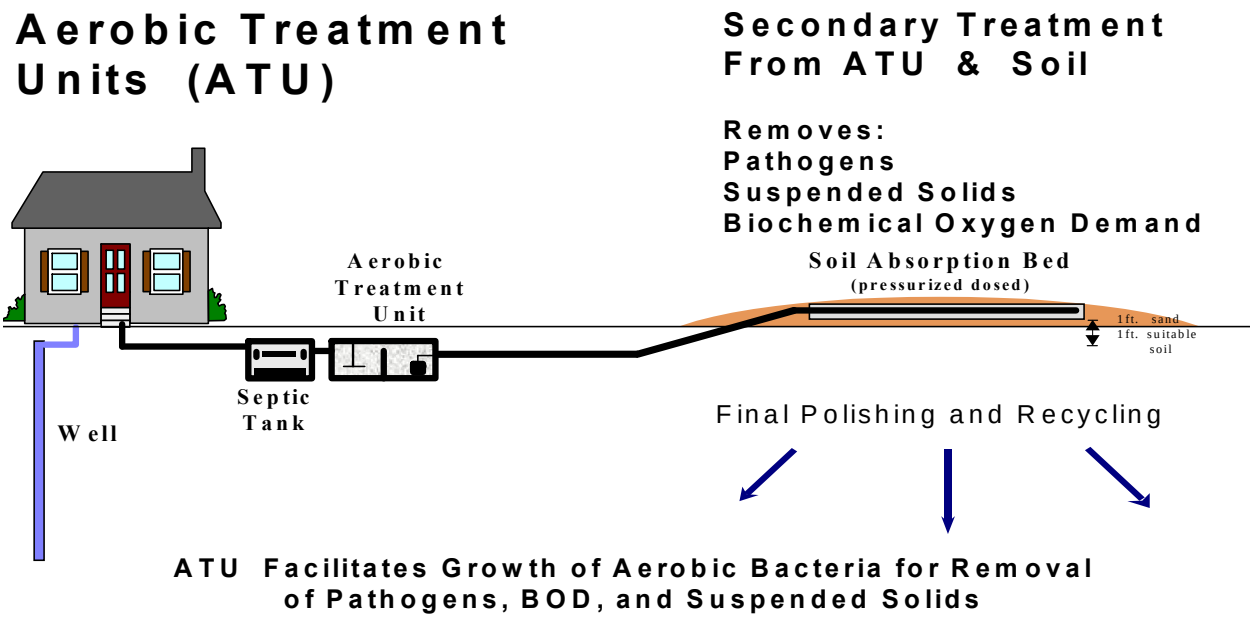
Because the effluent from the sand filter has already been treated by passage through 24 inches of sand of an approved size and consistency, the soil absorption bed is reduced to 24 inches of suitable soil (minimum 6 inches in-situ soil). And, because the sand layer is underground, the potential landscaping disadvantages of an above ground mound are alleviated. Also, since the sand filter treats wastewater within an enclosed structure, the sand can be replaced easily should the need arise.

As in all systems, septic tanks require periodic pumping of accumulated solids, as well as inspection to determine that the tank remains watertight. Solids must also be removed from the pump chambers periodically.

Sand filters have been used to treat domestic wastewater over a hundred years. About 45% of the health departments nationwide that responded to a recent survey stated that they permitted the use of sand filters.

The industry estimates that there are approximately 15,000 systems in use nationally. Close to 100 systems are in use in Wisconsin on an experimental basis. The version described in the figure above has been used extensively in Wood County, Wisconsin with very satisfactory results. The proposed Comm 83 code would make it available for general use in the state.

Prepared by the State of Wisconsin Department of Commerce, Division of Safety and Buildings. Version date 8/17/99



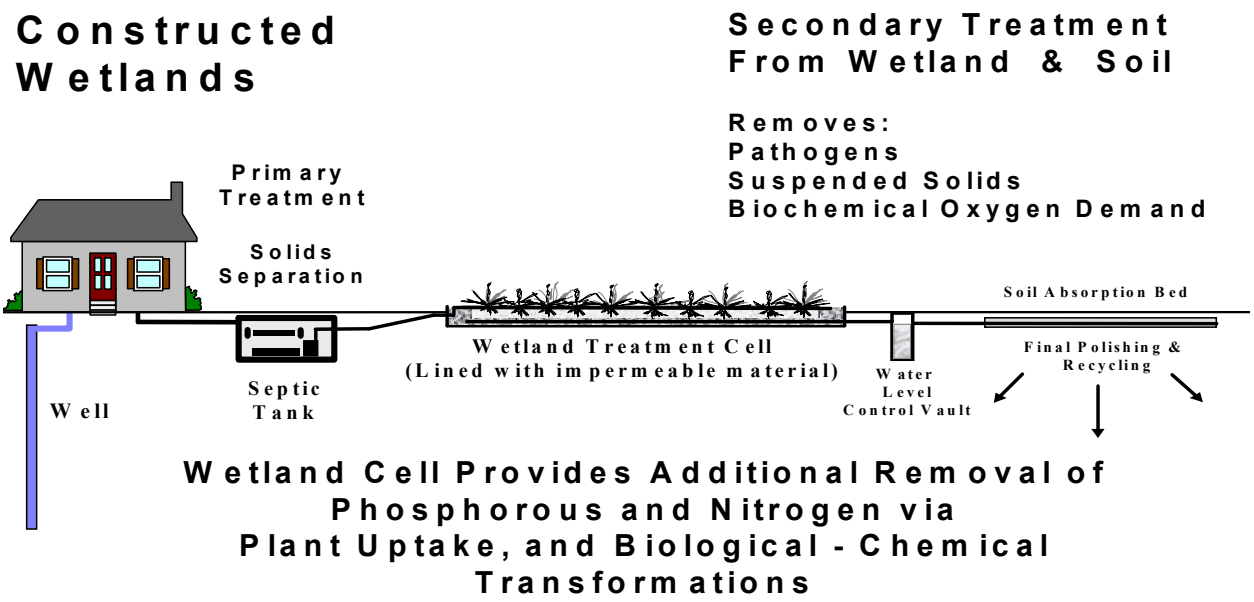
An Aerobic Treatment Unit (ATU) is a self-contained unit that uses blowers or propellers to aerate the wastewater. They may also have filters to remove suspended solids. The additional electrical components are no more complicated than those commonly used in mound systems. An onsite sewage system that incorporates an ATU has either a septic tank or contains a septic compartment for solids separation, followed by the ATU, and a soil absorption bed.

ATUs are initially seeded with bacteria to provide a suspended medium for the growth of aerobic microorganisms that remove organic materials from the wastewater. Wastewater is dispersed to a soil absorption bed. Depending on the amount of treatment the wastewater receives in the ATU (quality of the effluent leaving the ATU), treatment required of the soil absorption bed will be reduced, providing the potential to reduce the size of this bed. Thus, ATUs can be used where there is insufficient soil for the standard 36 inch vertical separation to groundwater or bedrock. Since effluent from the ATU is an aerobic product with low concentrations of BOD, it can also be used to rehabilitate an existing soil absorption bed that is clogged with microbial biomass.

Solids must be periodically pumped from the septic tank and the pump chamber. The ATU unit itself must be pumped at regular intervals to maintain a balance in the microbial fauna. Events such as a prolonged disruption of electrical service could disrupt the balance and require the tank to be pumped, reactivated, and re-seeded. These units should be inspected by a professional every six months or whenever an alarm is activated.

Although the use of suspended media is relatively new for small scale onsite sewage systems, municipal plants have used suspended aerobic media for successful secondary wastewater treatment since the early 1900s. Under the current code, over 200 ATUs have been used in Wisconsin for approximately 10 years with currently approved systems, experimental systems and to rehabilitate existing systems. Tens of thousands of ATUs are in use nationwide in such states as Washington, Oregon, Massachusetts, Pennsylvania, Ohio, Illinois and Texas. The revised Comm 83 would allow systems that use ATUs with proven treatment capability to reduce the vertical separation of the soil absorption bed to 24 inches.

Prepared by the State of Wisconsin Department of Commerce, Division of Safety and Buildings. Version date 8/17/99



A constructed wetland system consists of a septic tank, one or more wetland treatment cells, and a subsurface soil absorption bed. In the septic tank, solids settle out of the waste stream and anaerobic bacteria facilitate the partial breakdown of organic matter (primary treatment). Septic tank effluent is pumped, in controlled pressurized doses, to a discrete wetland cell which is designed to create and incorporate the treatment processes of natural wetlands. Effluent from the wetland treatment cell is then discharged to a soil absorption bed.

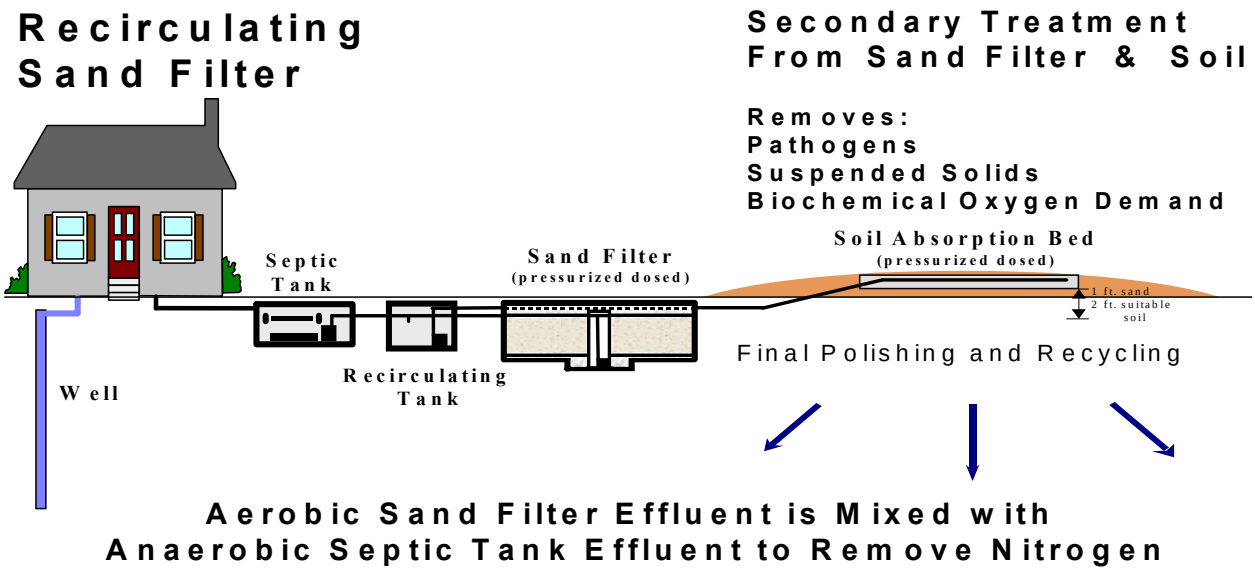
A typical wetland cell consists of an underlayer of pea gravel, overlain by soil that will support submergent and emergent wetland vegetation. The cell is lined with a layer of impermeable material to separate it from native soils and hydrological conditions. The water level is maintained below the gravel surface, thus preventing odors and public exposure to the wastewater being treated. In some cases, the cell is covered with a greenhouse. The wetland treatment cell removes organic matter, suspended solids, pathogens and nutrients through biological transformations, plant uptake and adsorption to soil particles. Some disinfection is achieved by exposure to UV light from the sun.

Costs for constructed wetlands vary significantly. They tend to be more expensive than most other onsite sewage systems because of the earthwork, land, structures, and design. However, depending on plant selection and design, they can also be very aesthetically appealing.

Solids must be periodically pumped from septic tanks and pump chambers and the treatment cells must not be overloaded. Minimum flow conditions are required to maintain the proper flora and fauna, and plants must be carefully selected to thrive in the specific conditions.

Development of constructed wetlands for wastewater treatment began in the early 1970s. They are recognized by the Environmental Protection Agency as effective treatment system and are used

successfully in states such as Minnesota, Iowa, Kentucky, Indiana and Texas. Thousands of these systems are in use nationwide serving both individual residences and small communities. There are over 5,000 wetland treatment systems in operation in Kentucky alone. Experience with constructed wetlands in northeastern Minnesota has shown their effectiveness during the harsh winters of the Upper Midwest. Two nature centers in the Upper Midwest, one in Iowa and one in Wisconsin, are also using these systems with great success. These systems will be approved individually under the proposed code. No design has yet been submitted for general use.



Aerobic Sand Filter Effluent is Mixed with Anaerobic Septic Tank Effluent to Remove Nitrogen

Removes 40% - 70% of Total Nitrogen

Prepared by the State of Wisconsin Department of Commerce, Division of Safety and Buildings. Version date 8/17/99

A recirculating sand filter consists of a septic tank, recirculating tank, sand filter and soil absorption bed. In the septic tank, solids settle out of the waste stream and anaerobic bacteria facilitate the partial breakdown of organic matter (primary treatment). Pressured doses of clarified effluent from the septic tank are discharged to the recirculating tank and from there to the sand filter. The sand filter is a buried chamber containing at least 24 inches of sand between layers of gravel. It serves as the fixed porous medium on which aerobic bacteria provide much of the secondary treatment. Pressurized doses of a portion (typically 20%) of the effluent from the sand filter are dispersed to the soil absorption bed, while the remainder (80%) is returned, mixed with incoming septic tank effluent, and passed through the sand filter again. This design takes advantage of the high concentration of organic matter and anaerobic conditions of the septic tank effluent; conditions which are necessary for nitrogen removal.

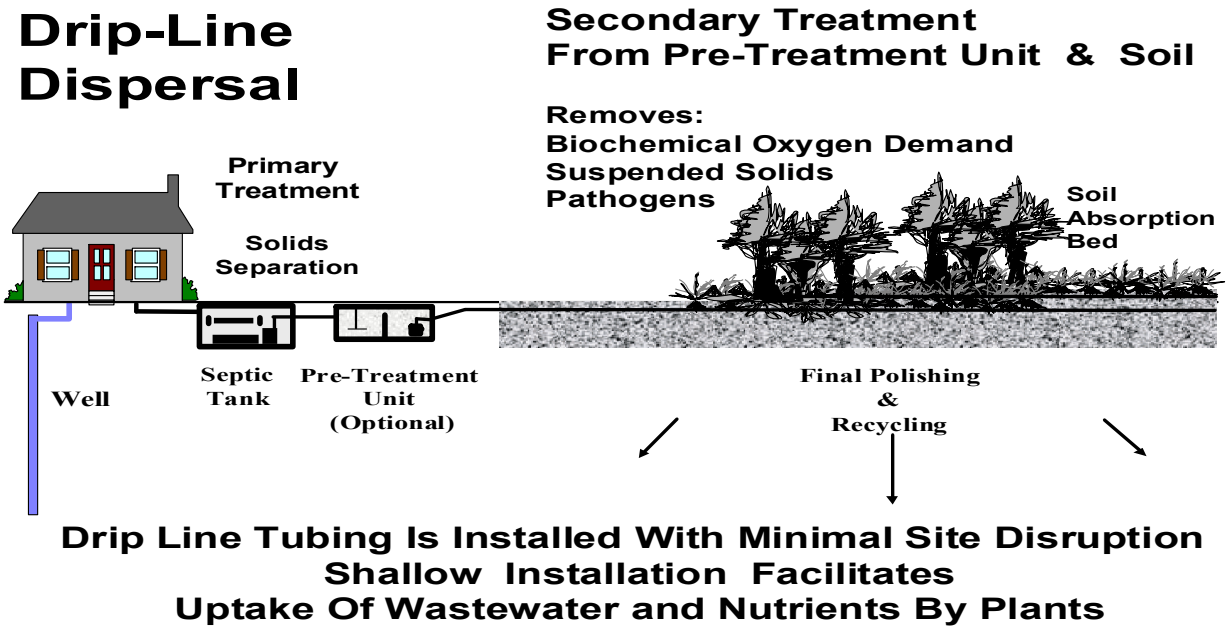
Some designs eliminate the recirculation tank by using a ñsplit bedò sand filter. Effluent distribution (to the septic tank and soil absorption bed) is achieved in this dual compartment tank. This results in less total area needed for system installation.

The primary advantage of these recirculating sand filters is that they are capable of removing from 40 to 70% of the total nitrogen present in the septic tank effluent. Although effluent from the sand filter will have been treated by passage through 24 inches of sand, due to the recirculation step the coliform level of the effluent is higher than that of the single pass filter. The soil absorption bed could potentially be reduced, but the amount of reduction would depend on the quality of the effluent. Because the sand layer is underground, the potential landscaping disadvantages of an above ground mound are alleviated. Also, since the sand filter treats wastewater within an enclosed structure, the sand can be replaced easily should the need arise.

Septic tanks and pumps require periodic pumping of accumulated solids. For optimum treatment and nitrogen removal, the adjustment of the proper recirculation ratio and sand filter loading rates is critical.

Sand filters have been used for wastewater treatment over a hundred years. Development of recirculating systems, however, began in the 1960s in an effort to remove more nutrients such as nitrate from domestic wastewater. Close to thirty of these systems are in use in Wisconsin on an experimental basis. Approximately ten thousand (residential and commercial) are in use nationwide, including in coastal regions such as the Chesapeake Bay where nutrient discharge is an acute environmental issue.

Prepared by the State of Wisconsin Department of Commerce, Division of Safety and Buildings. Version date 8/17/99



A drip line effluent dispersal component is a mechanical element of the soil absorption system. As with all onsite treatment technologies, primary treatment in a septic tank is required prior to discharging wastewater to the soil. A pump chamber delivers effluent to the drip lines in timed pressurized doses through a distribution network that contains a series of filters. The filters are flushed periodically to prevent clogging. The lines and emitters are impregnated with inhibitors to prevent solids build up and root intrusion. Frequent automatic flushing of the lines helps ensure trouble free operation.

While subsurface dripï line dispersal provides obvious benefits for arid regions of the country, these systems offer advantages to Wisconsin homeowners and communities as well. Drip lines offer an alternative to rigid effluent piping, aggregate, leaching chambers, and excavation in the distribution field. By using flexible tubing, a shallowly placed drip line network can be installed with minimal site disturbance. This flexible tubing can be õplowedò around obstructions (trees and boulders) that might otherwise need to be removed. These systems allow the delivery of smaller more frequent doses using pressure compensating emitters. By allowing smaller more frequent dosing, and spacing the lines two feet apart, drip-line irrigation better facilitates the use of slowly permeable soils for wastewater distribution. By discharging effluent directly to the root zone, wastewater can also be a source for irrigation and fertilization. Studies have shown that nutrient absorption by plant uptake can reduce the concentration of nitrogen and phosphorous in the effluent that enters groundwater.

Drip-line technology is a proven and efficient means of dispersing domestic wastewater that has been in use in the United States since the late 1980s. Industry representatives estimate that there are thousands of systems currently in use throughout the country, with approximately 3,000,000 linear feet (2,000 linear feet / household) of dripline sold annually for the purpose of wastewater distribution. These systems have undergone extensive research in the State of Minnesota to examine their operation in cold climates. Results from Minnesota and Wisconsin have shown that properly designed and maintained systems successfully resist freezing at depths of six inches below grade, the minimum depth required by the proposed Comm 83. There are approximately two dozen systems in operation in Minnesota. At present, eight systems are in use in Wisconsin on an experimental basis. Drip line systems are in use in other northern states including Michigan, Washington and Pennsylvania. The proposed Comm 83 will give Wisconsin homeowners and businesses access to this innovative and effective means of wastewater dispersal.

Prepared by the State of Wisconsin Department of Commerce, Division of Safety and Buildings. Version date 8/17/99

APPENDIX VC

Value of Groundwater Survey
Executive Summary

The purpose of the *Value of Groundwater Survey* was to document public concerns and perceptions about groundwater quality in Portage County.

The survey was mailed to a 5%-random sample of Portage County property owners in the summer of 1996. A follow-up survey was also sent to enhance participation. 47% of survey recipients responded.

RESULTS:

- Safe drinking water is highly-valued by Portage County property owners, and ranks as being the most important factor for a good quality of life (among those given).
- Portage County property owners are evenly split on whether or not the County is doing enough to protect the drinking water supply. Respondents who place more value on safe drinking water think the County should be doing more, while those who value safe drinking water less highly think the County is doing enough.
- Respondents perceive their personal water supply to be of higher quality than the quality of Portage County's groundwater.
- Over two-thirds of respondents feel the drinking water quality has changed in the County over the past ten years; the majority of those (70%) think that water quality has gotten "somewhat" or "much" worse.
- Residents of Portage County test their drinking water, although not as often as recommended. Almost 75% had tested their drinking water quality at some time in the past, but only one-third had it tested within the past two years. One-quarter of the respondents, primarily those on municipal water, reported never having their water tested.
- Respondents perceive agriculture to be the most significant source of groundwater contamination; over 80% of survey participants think that agriculture is "somewhat" to "very much" responsible for groundwater pollution.
- Respondents believe that leadership for groundwater protection should be distributed somewhat evenly across local (county-city), state, and individual sources, with a slight preference toward local leadership. In contrast, survey respondents felt financing for groundwater protection should be distributed among local, state and private sources.
- Respondents prefer their groundwater protection dollars be targeted towards pollution prevention activities, rather than towards clean-up of spill sites or treatment of contaminated groundwater.

The results of this survey will be used to help guide long-term groundwater management strategies in Portage County.

9. I feel groundwater should (check one):

35.5 be absolutely pure
55.7 have concentrations of human-induced contaminants at levels better than current drinking water standards.
2.0 have concentrations of human-induced contaminants at levels worse than current drinking water standards.
6.5 MISSING

10. How much do the following pollute Portage County's groundwater?

MEAN		1 Very Much	2 Somewhat	3 A Little	4 Not At All	MISSING
1.580	agriculture	49.6 ☐	35.0 ☐	9.1 ☐	.5 ☐	5.8
1.970	manufacturing	29.4 ☐	53.7 ☐	13.5 ☐	1.8 ☐	8.6
3.292	residential	3.3 ☐	27.7 ☐	44.9 ☐	14.1 ☐	10.1

11. We in Portage County are doing enough to protect groundwater quality.

40.6 agree 43.1 disagree 16.4 MISSING

12. What share of groundwater protection LEADERSHIP should come from each of the following (give percentages totaling 100 percent)?

17.39 individuals
10.85 federal government
5.55 state government
22.45 county government
9.9 town/city/village
10.04 private industry
____ other (please specify with percentage: _____)

13. What share of groundwater protection COSTS should each of the following be responsible for (give percentages totaling 100 percent)?

19.37 individuals
23.35 federal government
19.26 state government
19.62 county government
15.88 town/city/village
16.73 private industry
____ other (please specify with percentage: _____)

** 14. Currently all septic systems installed after 1980 are required to be pumped at least every three years. If this program was to include all septic systems in the county, how much should each of these households be required to pay for proper pumping and disposal of septage?

3.1 $ .00
4.8 $1.00
13.4 $2.00
22.2 $ 5.00
19.4 $10.00
11.2 over $10.00/month
21.7 MISSING

** 15. How much would you be willing to pay per month to keep all human induced groundwater contaminants at levels better than safe drinking water standards?

22.7 $ .00
24.7 $ 5.00
21.4 $10.00
9.1 $20.00
9.3 $ 50.00
.2 $100.00
.3 over $100.00/month
4.5 other amount
15.6 MISSING

16. If you were asked (and agreed) to pay a monthly fee for groundwater protection, what percent of this fee would you like to see go toward the following (percentages should add up to 100%)?

44.94 pollution prevention
15.97 clean up of "spill" sites
34.74 treatment of contaminated groundwater
____ other (please specify with percentage: _____)

17. How should dollars allocated for pollution prevention be distributed (give percentages totaling 100 percent)?

24.44 public information and education programs
26.36 regulatory programs
21.50 cost sharing for proper land use programs
27.31 technical assistance for voluntary groundwater protection practices
____ other (please specify with percentage: _____)

18. Please indicate your preference for the following groundwater protection education efforts?

MEAN		Very	Somewhat	A Little	Not At All	MISSING
2.723	one-on-one	29.9 ☐	28.0 ☐	31.4 ☐	12.3 ☐	18.4
3.182	newspaper	32.0 ☐	41.8 ☐	25.6 ☐	2.8 ☐	12.8
2.949	conferences/workshops	25.2 ☐	38.3 ☐	18.9 ☐	4.3 ☐	13.2
2.910	radio	29.3 ☐	37.0 ☐	20.2 ☐	5.8 ☐	13.1
3.097	TV	33.5 ☐	34.0 ☐	5.9 ☐	5.2 ☐	17.1
3.159	newsletters/brochures/mailings	35.8 ☐	32.7 ☐	11.6 ☐	5.3 ☐	13.6
3.43	educational programs in schools	39.4 ☐	24.9 ☐	7.3 ☐	2.8 ☐	14.1
	other (please specify: _____)	☐	☐	☐	☐	

19. Please rank the following in order of IMPORTANCE using each number only once (1 = least important; 7 = most important).

MEAN
5.372 quality education system
3.900 government that is sensitive to public needs
5.387 groundwater that is safe to drink
2.63 quality parks and recreation
5.167 communities safe from crime
4.78 sound economy/job base
____ other (please specify: _____)

20. City/Village of: St. Paris = 15.4% Vlevel = 13.4% Bell = 11.8% Plover = 6.6%
Township of: Stevens = 6.8% All Others = 44.8%
Age: 44.5 49.7 male 31.2 female 5.1 MISSING
Occupation: _____
MEAN = 12.28 Highest education level attained (circle one): 8 9 10 11 12 College (Degrees: _____)
Ages of others in household: _____
Kids Yes = 37.7% No/No Answer = 62.5%

21. Additional comments (attach separate sheet, if necessary): _____

APPENDIX RE

Status of Groundwater Management Plan (1988) Recommendations

High Priority: Completed **(YEAR)** or Ongoing

Designate Groundwater Coordinator **(1988)**
Support/utilize GIP, maintain land use/water quality databases
Coordinate intergovernmental discussion on annexation/sewering **(1992)**
Adopt wellhead protection ordinances **(1993)**
Encourage hydrogeologic studies of well field recharge areas
Intensify Agricultural BMP outreach efforts **(1990)**
Revise County Subdivision Ordinance **(1990)**
Improve compliance with County Private Sewage System Ordinance
Revise County Zoning Ordinance **(1993)**
Adopt Site Plan Review Ordinance
Expand educational programming in all program areas
Provide well testing/interpretation, encourage testing
Investigate Underground Tank Ordinance and update inventory **(1992)**
Revise waste landspreading criteria
Encourage State pesticide use reporting program
Encourage municipal water systems
Encourage municipal sewer systems
Support activities of the Central Wisconsin Groundwater Center
Develop homeowner information packet **(1995)**

Medium Priority: Completed or Ongoing

Encourage groundwater monitoring in local/State permits
Develop on-site sewage system inspection standards **(1991)**
Expand landfill investigations and monitoring
Support development of a hazardous waste hauler network
Support õclean sweepò programs as needed
Investigate possible Hazardous Materials Ordinance **(1998)**
Support moratoriums for critical products
Minimize road salt use
Revise County Development Guide
Review possible adoption of Private Water Supply Ordinance **(2002)**

Low Priority: Completed or Ongoing

Encourage recycling
Support changes in State on-site sewage system code
Encourage State review of septic system additives
Consolidate/monitor salt storage sites, review snow dump sites **(1989)**
Review pipeline proposals for groundwater concerns
Investigate Sanitary Ordinance for non-regulated wastewaters **(1994)**

Incomplete:

Revise County Private Sewage System Ordinance
Adopt local Septage Ordinance
Inventory on-site private sewage systems
Address maintenance criteria for animal waste structures

APPENDIX CE

Excerpt from Portage County Open Space Plan 2000

Land Acquisition

Land acquisition is a process in which a public agency or nonprofit conservation organization purchases all the ownership rights to the land from a willing seller. Public ownership of land may be the best choice when local governments need full control of the land. Drinking water sources and land by lakes and rivers may need special management to protect water quality. Environmentally sensitive lands such as steep slopes and areas with native plants or wildlife may need special care. People may want public access to the land for education and recreation.

Landowners are paid full fair market value based on an independent appraisal of their land. Landowners may receive tax benefits by donating all or part of the value of their land. To provide for a landowner that wants to continue living on the land, a public agency can delay public control of all or a portion of the land by negotiating a life estate or a leaseback arrangement. With a life estate, the public agency pays the landowner fair market value for the land minus the value of the landownerôs use during his or her lifetime, which depends on the projected life span of the landowner. The landowner receives payment during his or her lifetime and continues to live on the land. In a leaseback arrangement, the landowner leases all or part of the property from the new owner for certain specified uses, e.g. continued farming of a field.

For tax planning purposes, a landowner may prefer to receive several payments spread over time instead of one large sum at closing; lease-purchase and annuities are two potential methods to meet the landownerôs needs. In a lease-purchase, the agency purchases the land after making lease payments through an agreed-upon time period; the title is conveyed to the agency when the last lease payment is made. The total cost is usually the landôs fair market value at the time of the agreement, plus interest. With an annuity, a buyer purchases an annuity benefiting the seller and receives title to the land. The seller receives annuity payments, a set dollar amount, over time.

Conservation Easements

A conservation easement is a voluntary legal agreement between a landowner and qualified conservation organization or government agency that protects the conservation values of a piece of land by permanently limiting its present and future uses. This agreement is in the form of purchase or donation of certain rights (e.g. right to develop or right to access) that are needed to achieve an identified purpose such as resource protection or additional public access.

Any type of undeveloped or sparsely developed property can be protected with a conservation easement. Conservation easements can be used to protect agricultural land, forested land, wildlife areas, wetlands, and other scenic or natural lands.

A landowner that conveys a conservation easement retains all rights to use the land for any purposes that do not interfere with the conservation of the property as stated in the terms of the easement. The landowner retains the title to the property, the right to sell it, the right to restrict public assess, and the right to give it to whomever he or she chooses. However, most or all of the rights to develop are restricted or eliminated. The terms of a conservation easement are individually tailored to reflect each landownerôs particular needs, situation and property. The easement can be written to apply to the entire property or to only a portion of it.

When a conservation easement limits any of the property rights, the value of the land is affected. The value is determined by having an appraisal of the land before and after the easement. A qualified appraiser who meets IRS requirements must complete this appraisal. The difference between these two figures is the

value of the easement. In instances where the easement is donated and qualifies under IRS regulations, this amount also is the value of a charitable contribution that can be taken as an income tax deduction. Appraisal costs are the responsibility of the landowner considering donating a conservation easement.

Conservation easements may be eligible for *Federal Income Tax Benefits, Estate Tax Benefits,* and/or *Property Tax Benefits*. To be eligible for most of these tax benefits, the agreement must be entered into with a qualified conservation organization or a local unit of government. In addition, the terms of the easement must be perpetual and they must meet any other IRS requirements. One condition is that there must be an established, recognizable public benefit, such as protecting rare species, public water supplies, or scenic vistas visible from roads. Public access is not a requirement. Although the duration of a conservation easement can vary depending on the desires of the landowner, tax benefits are available only for perpetual easements. Many land trusts will only accept perpetual easements, since they provide permanent protection by subjecting all future landowners to the same restrictions.

Any organization that accepts an easement on land is obligated to oversee and enforce the easementôs terms and conditions. For example, the organization has the right to enter and inspect the property (usually once a year as scheduled with the landowner) to ensure that the terms of the agreement are being upheld.

Purchase of Development Rights

Under a Purchase of Developments Rights program, landowners voluntarily sell their rights to develop a parcel of land to a public agency or a charitable organization interested in natural resource conservation. The landowner retains all other ownership rights attached to the land, and a conservation easement is placed on the land and recorded on the title. The buyer essentially purchases the right to develop the land and retires that right permanently, thereby assuring that development will not occur on that particular property. The landowner is generally compensated for the value of the right to develop the land through the following formula:

Appraised Value for Development	**–**	**Appraised Value for Agriculture/Conservation**	**=**	**Appraised Value for Development Rights**

APPENDIX AD

Final Report: Agricultural Development and Diversification Grant Program

(January 1, 2002)

Project Name: Community Supported Agricultural Diversification

Grant Recipient: Golden Sands Resource Conservation and Development (RC&D) Council, Inc.

Original Intent of Project…
The original intent of this project is to:

A) Help interested farmers learn more about groundwater-friendly alternative crops that are suited to this climate.
B) Connect farmers with the technical resources necessary to grow these alternative crops.
C) Bring the economic development and lending entities together with the farmers to create local markets for their products.
D) Develop agro-ecosystem diversification plans with 10 area farmers.
E) Foster one model partnership between farmers, lenders and economic development personnel.

Introduction....
This project was funded through an Agricultural Development and Diversification (ADD) Program grant from the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) to address the need to bolster farm economics through diversification while addressing water quality issues. The grant was awarded to and administered by the Golden Sands Resource Conservation and Development (RC&D) Council, Inc., a 501(C) 3, non-profit corporation working in nine Central Wisconsin counties since 1972. The project addressed the following objectives of the Marketing Division of the Wisconsin Department of Agriculture, Trade and Consumer Protection: *a) Diversification of the production of agricultural products, b) Market development for agricultural products, and c) "Production models that speak to sustainable practices and enhance economic returns to farmers*".

History...
In the Central Sands area of Wisconsin, it has been determined that growing the typical vegetable crops (potatoes, sweet corn and snap beans) results in nitrate contamination of groundwater beyond drinking water standards, even with so-called BMP's like irrigation scheduling and following UWEX fertilizer recommendations. The consensus among groundwater "experts" is that the type of crop grown has a greater impact on groundwater contamination than do the cultural practices used in crop production. Growing low nitrogen-demanding crops would result in the greatest reduction in nitrate contamination. In the case of municipalities that get their drinking water from deep wells located within their city, the groundwater recharge area is often in close proximity to the city's economic center. Hence, it makes sense that municipalities would be willing to protect the quality of their drinking water supply by helping farmers market groundwater-friendly crops that can be grown within the recharge area and marketed to businesses in town. Preliminary discussions with officials from Stevens Point and Plover indicated that they supported this theory. In addition, a meeting with local area growers indicated that they were interested as well.

Goal...
The goal of the project is to facilitate the creation of a new, value-added process that fosters community support for diversified, sustainable, groundwater-friendly agriculture and results in a model organizational structure where interested farmers can enter into a partnership with economic development entities, gain community support and solidify local markets to add value to the crops they raise.

Project Description...

1. Develop a list of alternative crops that serve the growing consumer demand and can be grown in this geographic area.
2. Meet with 15-20 area farmers and gather their ideas about the theoretical production of the crops listed in #1 above. Get 10 farmers to agree on 4-5 crops that may be infused into their current operation.
3. Develop diversified crop plans for 10 cooperating farmers.
4. Bring farmers, lenders and economic development staff together to develop market strategies and a business start-up plan.
5. Submit final report to DATCP.

Results...

A grower meeting was set up for 12/19/00 in Stevens Point. The invitees were mainly vegetable growers from the Stevens Point/Plover area. There was one local dairy farmer. The project was outlined to them and they were asked for general input. There seemed to be genuine interest in the general scope of the project. Many items were discussed related to the project. There was discussion regarding dry edible beans, alfalfa, alternative fiber crops, soybeans and others. One participant felt that whole systems would be the way to go. For instance; incorporate a large dairy operation with a soybean processing facility so there is a place to go with the excess meal. The same could be done with alfalfa. The perception of large-scale agriculture was also discussed. It was felt that the public needs to be educated and perceptions changed for some projects to work.

A meeting was set up with Roger Hilliard of Soyco, LLC. He went through the process used to extract the oil and produce the meal. They are interested in providing the raw materials to others, but realize that they may need to add value on their own. The oil seems to have a good market, but at this point does not seem to have enough value to be able to carry the meal if the meal is sold at commodity prices. At this time they need $30-60/ton over commodity price and the local livestock/dairy will not pay it. They produce some value-added products and have some small markets but they need to be expanded. The main problem that they face is in marketing, especially the meal at a price to break even.

A second meeting was set up with two of Soyco's board of directors. They were asked about their feelings, and their sense of the rest of the members feelings, about expanding the size of the operation and the number of grower members. This would give them some capital to explore more product uses and markets. I got the feeling they would be happy to explore this possibility, they want to see the business succeed. After this meeting, contact was made with growers that participated in the original grower meeting on 12/19/2000. They were asked their opinion about a large scale operation of this nature in the area. Again, the feedback was positive. When asked if they would be willing to serve on a committee to explore possibilities like this, they were not willing to participate.

So far soybeans have been the main focus of investigation. This is a crop that many growers are familiar with and are comfortable growing. This crop fits the goals of the grant and is an expanding use crop, especially in the human food products area and in the industrial area as biofuels, adhesives, inks, etc. There is also work being done to use soybean meal to replace some of the fish meal in feeds for the rapidly growing aquaculture industry. Barriers for this crop include widespread competition in the marketplace, and growers in this area that do not have a basis for LDP payments.

The second area of research has been in alfalfa. Again, this is a crop that area growers are comfortable with. This is a nice crop for the area and also fits very well into the scope of the project. Again, the uses for alfalfa are ever expanding. It has the standard value as a widely-used forage, but the value can be increased if it is pelleted or cubed. The crop can be wet fractionated and there are estimates that the liquid portion has a value of $1000/A. This can be in the form of protein concentrates for humans and animals, other feed supplements, cosmetics, industrial enzymes, etc. The fiber portion also has many uses such as custom fiber content feeds, building materials such as fiberboard, pulp for paper, using for direct combustion to generate electricity or use emerging modern technologies for cellulose digestion to render the

fiber available for ethanol production. One question for this crop with vegetable growers is will it fit into their existing rotation? At least two years are needed for efficient alfalfa production and maybe three.

Other áalternativeô crops are out there and would fit well into the scope of the grant. These are mostly legumes that would reduce nitrogen use the most. Barriers are mainly in the limited market available for these crops, knowledge in the agronomic needs, and specialized equipment that may be needed. Research into the practicality of hemp fiber for paper is ongoing, however, from the limited agronomic information found on hemp suggests that it requires fairly high fertility and is a poor user of nitrogen. If this is true, it would not be a suitable crop.

Alfalfa

Alfalfa is widely grown in this region and area growers are familiar and comfortable with growing this crop. Alfalfa is one of the best crops that would fit well into the program for reducing nitrates in the groundwater and also for reducing area pesticide usage.

The main use for alfalfa has been a hay and silage crop for livestock, and personal communications with crop consultants from around the State indicate that there is a good demand for good quality alfalfa for livestock. Alfalfa can also be dried, ground and pelleted and marketed as a feed for other animals such as rabbits and small pets. Larger cubes can be made to produce a feed for horses and cattle that is more easily shipped and stored. All of these products produce some increased value opportunities but the cost of production also goes up.

Nontraditional Uses for Alfalfa

There are many new or non-traditional uses being developed for alfalfa. Wet fractionation is a process where fresh alfalfa is pressed and the wet or liquid fraction is separated from the dry or fiber fraction. There are more and more uses for each fraction being developed. Estimates for the value of products utilizing the liquid portion, which include enzymes, carotenoids and protein, are up to $1000/A gross. These products can be in the form of protein concentrates for humans and animals, other feed supplement extracts, cosmetics, industrial enzymes, etc. Alfalfa may be important in biotechnology since it is easily grown and regenerated in cell culture and is receptive to genetic modification. Research is well under way to use alfalfa to produce industrial enzymes in this manner which would be recovered by fractionation and extraction.

The fiber portion also has many uses such as custom fiber content feeds, building materials such as fiberboard, pulp for paper, direct combustion to generate electricity. New enzyme technologies are emerging for cellulose digestion to render the fiber available for ethanol or lactic acid production. Lactic acid is used in the manufacture of plastics. One-hundred pounds of fiber can produce 60# of lactic acid with a value of $1.00/#. However, the cost would need to be 1/3 of that before the major manufacturers like Cargill or Dow would purchase it. With both ethanol and lactic acid production from fiber, the cost of the enzymes needed at this time are too expensive to economically produce these materials. Research and time are needed before it becomes feasible. However, an existing ethanol production facility could easily be converted from corn to fiber with minor modification.

Soybeans

Soybeans are a crop that many area growers are familiar with and are comfortable growing. This crop is a great fit for the goals of reducing groundwater nitrate levels. Soybeans are inoculated with nitrogen fixing bacteria before planting and many are grown with little or no additional nitrogen application. The pesticide usage is also minimal compared to some of the other crops grown in this area, making it fit the goals even better.

The uses for this crop are rapidly expanding. especially in the areas of human food products and in industrial uses. As the nutritional benefits of soy as a quality food product are becoming better known, the demand for high quality food grade soybeans is increasing. Much of the demand is for export but local

demand is also increasing and may become a significant share of the demand. These are in addition to the traditional soybean oil market.

Industrial uses of the oil include biofuels, adhesives, inks, resins, detergents and many others. Examples of other products derived from soy include building boards, cosmetics, wood binders, etc.

Of course, soybean utilization for animal feed products are widely recognized, but uses in this area are also increasing. For example, there is work being done to use soybean meal to replace some of the fish meal in feeds for the rapidly growing aquaculture industry. This has been done in the feeds used for herbivorous fish, but lately research has been expanded into feeds for carnivorous species also.

Barriers for growing this crop profitably include widespread competition in the marketplace for standard commodity soybeans, and many growers in this area that have not grown this crop do not have a basis for LDP payments. The small food-grade niche markets are where the value is high enough to make this an attractive crop for the Central Sands area, but growers must be willing to find these markets.

There is one local example of a small cooperative where several growers got together to process their soybeans themselves. They mechanically extract the oil without solvents, leaving a high quality meal that can be marketed to local dairy or livestock operations or processed into any number of nutritious products for human consumption. The problem this small group is having is in marketing. They are mainly interested in providing the raw meal and oil to others, but realize that they may need to add value on their own. The oil seems to have a good market, but at this point does not seem to have enough value to be able to carry the meal if the meal is sold at commodity prices. At this time they need $30-60/ton over commodity price for the soybean meal and the local livestock/dairy industry will not pay this. They produce some value-added products and have some small markets but they need to be expanded.

Fiber and Pulp Crops

Several crops have been investigated for use in producing fiber for pulp for paper production and other fiber products. The three main fiber crops that have been researched for this project are hemp, kenaf and hybrid poplar. Cereal grains such as wheat, barley and corn have also been looked at for fiber production and will be briefly mentioned below.

Hemp

Hemp is the fiber crop that has had the most publicity lately, probably as much from the legal status as from its value as a fiber crop. Hemp is a form of Cannibis sativa or marijuana. Even though the form that is referred to as industrial hemp has virtually none of the compound responsible for the psychoactive properties of marijuana, federal drug agencies are against letting this fiber crop become legal. Part of the resistance is because they say they would not be able to tell the difference between marijuana the drug, and hemp the fiber crop. This really is not a valid argument because the two crops must be planted and grown differently to maximize the production of each. Hemp is a tall crop planted with a very close spacing so as to maximize the size and number of stems from which the fiber is derived, marijuana is grown much shorter and planted with a wide spacing to maximize leaves and blooms.

Hemp has been used historically as a source of strong fiber, mainly in the manufacture of rope. The seeds have long been used as an oil source and are still used in bird seed. Uses for the fiber now include textiles, paper, and composite wood products. The oil can be used as most seed oils can for cooking oil, detergents, and dietary supplements. The meal that remains is used for feed, flour, snack foods and many other useful products.

As the strong history of industrial hemp growing in Wisconsin confirms, the climate here is very suitable for the production of hemp. It prefers a moderate climate with adequate rainfall. A fine seedbed, easily done in this area, is important for good germination. The location of the area papermaking facilities is a big plus for growing industrial hemp in this area. The major drawback for hemp for this area is the nutrient requirements. Information gathered indicates that this crop requires moderate amounts of nitrogen and it may be a poor user of N. Hemp may not, therefore, be a good crop to use to reduce nitrates in the groundwater, but could be a valuable alternative crop for area growers.

Kenaf

Kenaf is a more recent addition in the U. S. fiber crop industry. This crop is related to okra and cotton. It grows like hemp, usually with a single stem to a height of 12 -14 feet. It has traditionally been processed in a similar manner, by retting. After retting, the long fibers are mechanically separated from the short fibers. Most of the uses have centered around the short soft fibers, or bast. Bast fiber can be used in paper, blended with plastics for molding, used in textiles and many other products. The core, or long fibers are used as oil absorbents and soil-less potting mixes.

The growing conditions in Wisconsin may limit maximum production but varieties are being developed that may do very well in this part of the country. Kenaf, like hemp, would be a nice addition to the crops available to Wisconsin farmers, but probably would not fit well into a plan for reducing groundwater nitrates in the Central Sands.

Hybrid poplar

The growing of hybrid poplar for pulp and paper production or for structural and/or fiberboard manufacture has been studied in Wisconsin for some time. Whether this crop would ever be a viable one for the high value vegetable production areas of Central Wisconsin remains to be seen. Changing over to a long (8-15 year) rotation crop is difficult for area growers. Concerns over the returns are probably the main hindrance, but with new varieties that mature in less than 8 years, there may be some new interest in taking a look at this crop. Also attractive is the proximity of the paper mills that could utilize this crop.

Hybrid Poplar would be one of the best crops for groundwater nitrate reduction in central Wisconsin. This is a long term crop that would require little or no fertilizer inputs and would probably mine nitrates from the water table.

Grain Straws

Wheat, barley, corn and other cereal straws have also been studied for fiber production. The advantage of using agriculture residues is that there is already a return to the grower for the grain produced. However, the fiber is not the best available for paper production but it has been used for lower quality papers. The fibers are also higher in silica, which can be a problem for paper production. There are several plants in the upper mid-west that are already using the grain straws in the manufacture of fiberboard and other building materials.

Central Wisconsin has a good climate for cereal grain production. The nitrogen input requirements vary depending on the crop, but they are generally less than the currently grown vegetable crops. Increasing the acreage of grains would be a positive step in the reduction of nitrates in our area groundwater.

For more information, contact:

William Ebert, Coordinator
Golden Sands Resource Conservation and Development (RC&D)
1462 Strongs Avenue
Stevens Point, WI 54481
(715) 343-6215 ebertb@co.portage.wi.us

APPENDIX WA

Portage County Private Water Systems Ordinance

20.1 Title
20.2 Authority and Adoption
20.3 Jurisdiction
20.4 Purpose
20.5 Intent
20.6 Effective Date
20.7 Severability and Nonliability
20.8 Repeal
20.9 Definitions
20.10 County Responsibilities
20.11 Cooperation
20.12 Administration
20.13 Appeals
20.14 Violations
20.15 Administrator Directives and Orders
20.16 Enforcement Actions
20.17 Fee Schedule

20.1 TITLE
This chapter shall be referred to as the Portage County Private Water Systems Ordinance.

20.2 AUTHORITY AND ADOPTION
(1) This Ordinance is adopted under the authority granted to the County by ss. 59.70(6) and 280.21, Wis. Stats., and ch. NR 845, Wis. Adm. Code.

(2) This Ordinance is subject to the provisions of ss. 59.70(6) and 280.21, Wis. Stats., and all rules promulgated thereunder regulating private water systems.

(3) This Ordinance may not be more lenient nor more stringent than the rules promulgated pursuant to ch. 280, Wis. Stats.

(4) Failure to comply with any of the provisions of such regulations shall constitute a violation of this Ordinance, actionable according to the penalties provided herein.

(5) This Ordinance applies to the entire County, and includes cities, towns, villages, and sanitary districts in the County. The County will not administer a well abandonment program in incorporated municipalities currently administering such a program.

20.3 JURISDICTION
The provisions of this Ordinance shall apply to all private water systems within Portage County.

20.4 PURPOSE
The purpose of this Ordinance is to protect the drinking water and groundwater resources of the County through regulating well and drillhole abandonment, and to identify private water systems that produce water that may pose health threats to the users.

20.5 INTENT
The intent of this Ordinance is to regulate the abandonment of all well and drillholes, the administration and enforcement of this Ordinance, and to institute a Countywide program to identify portions of aquifers presenting health risks to those who drink the water from private wells.

20.6 EFFECTIVE DATE

This Ordinance shall be effective upon its adoption by the Portage County Board of Supervisors.

20.7 SEVERABILITY AND NONLIABILITY

If any section, provision, or portion of this Ordinance is adjudged unconstitutional or invalid by a court of competent jurisdiction, the remainder of this Ordinance shall not be affected. The County asserts that there is no liability on the part of the County Board of Supervisors, its agencies, or employees for any health hazards or damages that may occur as a result of reliance upon, and compliance with, this Ordinance.

20.8 REPEAL

All other County ordinances or parts of ordinances inconsistent or conflicting with this Ordinance, to the extent of the inconsistency only, are repealed.

20.9 DEFINITIONS

In this Ordinance:

(1) **Administrator** means the County employee or employees designated by the County Board of Supervisors to administer ch. NR 812, Wis. Adm. Code, pertinent to well and drillhole abandonment in the County as authorized by the Department.

(2) **Central Office** means the Bureau of Drinking Water and Groundwater of the Wisconsin Department of Natural Resources, located in Madison, Wisconsin, which functions as the coordinating authority for the statewide water supply program.

(3) **Community water system** has the meaning designated in s. NR 811.02(7), Wis. Adm. Code.

(4) **County office staff** means County office personnel trained to answer general well and drillhole abandonment, and water quality questions.

(5) **Delegation level** means the program level, as set forth in s. NR 845.05, Wis. Adm. Code, at which a county is authorized to administer and enforce ch. NR 812, Wis. Adm. Code.

(6) **Department** means the Wisconsin Department of Natural Resources.

(7) **Existing Installations** has the meaning designated in ch. NR 812, Wis. Adm. Code.

(8) **Health hazard** means a condition which constitutes:

(a) A violation of ch. NR 812, Wis. Adm. Code, regarding the installation, construction, operation, or maintenance of a private well.

(b) Confirmed bacteriologically unsafe well water quality.

(c) A threat to safety or groundwater quality.

(d) Confirmed chemically-unsafe well water quality.

(9) **Noncommunity water system** means a public water supply system that is not a community water system. It serves at least 25 persons per day, at least 60 days each year. A noncommunity water system commonly serves a transient population rather than permanent year-round residents. (**Note:** *Examples of a noncommunity water system include those serving schools, motels, restaurants, churches, campgrounds, and parks*.)

(10) **Noncomplying well** means a private water system not in compliance with all provisions of ch. NR 812, Wis. Adm. Code.

(11) **Person** means an individual, corporation, company, association, cooperative, trust, institution, partnership, state, public utility, sanitary district, municipality, or federal agency.

(12) **Personal interest** means having a financial interest in a property, or being related by marriage or birth to a person having a financial interest in a property.

(13) **Primary drinking water standards** means those maximum contaminant levels which represent minimum public health standards set forth in ch. NR 809, Wis. Adm. Code.

(14) **Private water system** means the water collection, storage and treatment facilities, and all structures, piping, and appurtenances by which water is provided for human consumption by other than community water systems. For the purpose of this Ordinance, it includes noncommunity water systems, and other water systems not regulated by the DNR.

(15) **Private water system ordinance** means a County ordinance, approved by the Department, regulating private water systems at the County's authorized delegation level.

(16) **Private well** means any drilled, driven point, dug, bored or jetted well constructed for the purpose of obtaining groundwater for potable use, including wells constructed in special well casing depth areas and noncommunity wells. It does not include springs, or private or public wells that require written plan approval from the Department.

(17) **Public Water System** has the meaning designated in ch. NR 811, Wis. Adm. Code.

(18) **Reconstruction** means modifying the original construction of a private well. It includes, but is not limited to, deepening, lining, installing or replacing a screen, undermining, hydrofracturing, and blasting.

(19) **Region Office** means the Department office located in Eau Claire, Wisconsin.

(20) **Variance** means an approval issued by the Department under ch. NR 812, Wis. Adm. Code, allowing a private water system to vary from ch. NR 812, Wis. Adm. Code, requirements, if Department approved conditions are met, and strict compliance with ch. NR 812, Wis. Adm. Code, is not feasible.

(21) **Water system** means the water collection, storage, treatment facilities and all structures, piping and appurtenances by which water is provided.

(22) **Well** has the meaning designated in s. 280.01(6), Wis. Stats.

(23) **Well Construction** means the procedures, methods, materials, and equipment used during the construction or reconstruction of a private well.

20.10 COUNTY RESPONSIBILITIES

Level 5 ï Well and Drillhole Abandonment**.** The County shall require the proper abandonment (filling and sealing) of wells and drillholes in accordance with standards established in s. NR 812.26, Wis. Adm. Code. The County may also require the abandonment of a well with water exceeding a primary drinking water standard listed in ch. NR 809, Wis. Adm. Code, or other chemical compounds for which State health advisory limits have been issued, including inorganic and organic compounds, after consultation with the Department.

20.11 COOPERATION

The Administrator shall cooperate with all other governmental units and agencies in the enforcement of all State and local laws and regulations pertaining to matters in this Ordinance.

20.12 ADMINISTRATOR

The County Water Quality Specialist shall act as the Portage County Administrator, and is assigned the duties of administering the private water systems program in accordance with Department rules.

The Administrator shall have the power and duty to enforce the provisions of this Ordinance and all other ordinances, laws and orders of the County and of the State of Wisconsin, which relate to the abandonment of all wells and drillholes within the County at the County's authorized delegation level.

(1) Qualifications of Administrator. The Administrator shall be informed on the principles and practices of well and drillhole abandonment, and shall have knowledge of applicable drinking water standards and health impacts of unsafe drinking water supplies.

(2) Powers**.** The Administrator shall have all the powers necessary to enforce the provisions of this Ordinance commensurate with the level or levels of the County's delegated authority including the following:

(a) In the performance of his duties, the Administrator or an authorized assistant may, **with permission**, enter any building or property upon presentation of the proper credentials, during reasonable hours for the purpose of inspecting the private water system for purposes stated in 20.4 above. No person may interfere with the Administrator or authorized assistants in the performance of their duties. Any person interfering shall be in violation of this Ordinance and is subject to penalty as provided by this Ordinance. If consent to enter a property for inspection purposes is denied, the Administrator may obtain a special inspection warrant under ss. 66.0119(2), Wis. Stats.

(b) Order any person owning, operating or installing a private water system to abandon, modify, repair or replace it in a complying, safe and sanitary condition, if the system is found to be unused, bacteriologically unsafe, or not in compliance with ch. NR 812, Wis. Adm. Code, or the County ordinance.

(c) Appoint assistants to aid in processing well and drillhole abandonments.

(d) Enforce any or all ordinances applicable to private water systems in accordance with Department rules.

(e) Obtain samples from any well to determine aquifer suitability for drinking water purposes. **The well owner shall bear no cost for sampling or analysis. Results of sample analysis shall be provided to the well owner.**

(3) Duties of Administrator. It shall be the duty of the Administrator to enforce the provisions of this Ordinance and perform the following duties commensurate with the level or levels of the County's delegated authority.

(a) Provide the Department with copies of all abandonment inspection forms and correspondence as required by ch. NR 845, Wis. Adm. Code.

(b) Investigate and record all private water system complaints pertinent to well and drillhole abandonment.

(c) Investigate cases of noncompliance with this Ordinance, ch. NR 812, Wis. Adm. Code, and ch. 280, Wis. Stats., issue orders to abate the noncompliance, and submit violations to the District Attorney or County Corporation Counsel for enforcement.

(d) Refer complaints and cases of noncompliance to the Department that are believed to be or known to be beyond the scope of the County's delegation level.

(e) Cooperate with all other government units and agencies in the enforcement of all State and local laws and regulations of matters related to this Ordinance.

(f) Assist the Department as specified in ch. NR 845, Wis. Adm. Code.

(g) Refer, to the Department, variance requests and actions which require Department approval.

(h) The Administrator, a trained County inspector, or County office staff shall be available at the Administrator's office to provide information regarding well and drillhole abandonment for a minimum of four regularly scheduled hours each business day.

(i) Establish a sampling program that meets the intent stated in 20.5 above.

20.13 APPEALS

Persons seeking to appeal decisions of the Administrator under this Ordinance shall file written letters of appeal with the County Water Quality Specialist. The appeal process shall be conducted in accordance with applicable statutes and administrative rule. The Director of Planning and Zoning will review any appeal and may uphold, uphold with modifications, or reverse, the decision of the Administrator. If the appellant is unsatisfied with the result of the review by the Director of Planning and Zoning, the appeal shall be placed on the agenda of the County Planning and Zoning Committee, and the appeal shall be given a due process proceeding. The Committee shall decide whether to uphold, uphold with modifications, or reverse the Administrator's decision based upon the terms and intent of this Ordinance and of relevant State laws and administrative rules. No appellate decision of the Committee shall have the effect of approving an existing or proposed condition that

would violate this Ordinance, State law, or administrative rule. Appeals that may only be approved by the granting of a variance to ch. NR 812, Wis. Adm. Code, shall be referred to the Department pursuant to s. NR 845.09(11)(b), Wis. Adm. Code. Committee appellate decisions shall be made in writing and shall be permanently filed in the Administrator's office. Appeals of decisions made by authorized agents on the behalf of the Administrator, shall be made first to the Administrator and then be appealable as provided herein.

20.14 VIOLATIONS

The Administrator shall investigate violations of the Private Water System Ordinance and ch. NR 812, Wis. Adm. Code, relating to the County's authorized delegation level(s), issue orders to abate the violations, and submit orders to the District Attorney or County Corporation Counsel for enforcement.

20.15 ADMINISTRATOR DIRECTIVES AND ORDERS

(1) Field Directive. The Administrator, after investigation and a determination that a violation exists, may issue a written field directive. This field directive may consist of a hand written note on an inspection report, or similar paper, identifying the violation that has occurred and assigning a date by which the violation must be corrected, and shall include the inspector's telephone number and office address.

(2) Formal Directive. A formal letter may be issued, which states the violation, the Ordinance (administrative rule or statutory) section violated, the date the violation was noted, the inspector who noted the violation, and assigns a date by which the correction must be made.

(3) Correction Order. Upon discovery, and after documentation of a violation, the Administrator may issue a corrective order. The Administrator may use a stepped enforcement procedure by issuing a directive before an order or may proceed directly to issuing a correction order. An order shall include the following:

(a) The location of the violation (site).

(b) The names of the parties involved such as the, owner, permittee, well constructor, or pump installer.

(c) The section(s) of the Ordinance and Wisconsin Administrative Code section(s) violated.

(d) The date of inspection of the site where the violation occurred.

(e) The name of the person who conducted the inspection, which revealed the violation.

(f) The date by which the correction(s) must be completed.

(g) The name of the person who must be contacted regarding subsequent inspection of the site.

(h) A statement that, if the order is not complied with, the Administrator will refer the violation to the District Attorney or County Corporation Counsel with a recommendation to seek injunctive relief and/or forfeitures from the Circuit Court of Portage County. (Orders must be signed by the Administrator of the private water system ordinance.)

(i) Orders shall be served on the property owner by certified mail. Where appropriate, the Administrator may request the Portage County Sheriff to serve any particular order.

(j) The Administrator shall report all orders that have not been complied with to the District Attorney or the County Corporation Counsel for enforcement.

(4) Should a property owner fail to follow a directive or order of the Administrator (except as provided in 20.13 above), the Administrator shall take necessary actions to obtain compliance, and place the costs of compliance on the property tax roll as a special charge.

20.16 ENFORCEMENT ACTIONS(1) An enforcement action may be brought by the District Attorney or County Corporation Counsel against a person or persons for any of the following violations:

(a) Failure to comply with any provision of this Ordinance.

(b) Failure to comply with any directive or order issued by the County Administrator.

(c) Resisting, obstructing or interfering with the County Administrator's, or an authorized assistant's, actions undertaken pursuant to this Ordinance.

(2) The District Attorney or County Corporation Counsel may, for any violation, seek:

(a) Injunctive relief.

(c) Forfeitures of not less than $_____ nor more than $_____ , or both for each violation. (Each day a violation exists is a separate offense.)

(3) Any person who has the ability to pay any forfeiture entered against him or her under this Ordinance, but refuses to do so, may be confined in the County Jail until such forfeiture is paid, but in no event to exceed thirty (30) days. In determining whether an individual has the ability to pay a forfeiture imposed under this section, all items of income and all assets may be considered regardless of whether or not the income or assets are subject to garnishment, lien, or attachment by judgment creditors under the laws of this state.

APPENDIX HC

RE: HIGH-CAPACITY MUNICIPAL WATER WELLS

TO THE HONORABLE CHAIRMAN AND MEMBERS OF THE PORTAGE COUNTY BOARD OF SUPERVISORS

WHEREAS, the economic base of Portage County depends heavily upon farming, manufacturing and tourism, which depend on the preservation of natural resources, especially water resources; and

WHEREAS, Portage County contains many lakes, rivers, streams, and wetlands that are susceptible to degradation and require special environmental protection; and

WHEREAS, groundwater is a critical resource for the maintenance of our lakes, rivers, streams, and wetlands; and

WHEREAS, large scale removal of groundwater has an adverse effect upon groundwater quantity and upon associated surface water levels, potentially causing irreparable harm to these special environmental and economic resources; and

WHEREAS, the installation, in the Town of Grant, Portage County, of one or more high capacity, municipal wells for the City of Wisconsin Rapids is being considered and discussed, with the intention of removing large volumes of water; and

WHEREAS, suitable areas exist within Wood County for the construction of wells for the City of Wisconsin Rapids water supply system; and

WHEREAS, residents in the area of the proposed wells have substantial investments in their private water supply systems; and

WHEREAS, these private water supply systems could be adversely affected by the pumping of large quantities of water from the proposed municipal well(s); and

WHEREAS, wellhead protection requirements, which may be proposed by the City of Wisconsin Rapids, will restrict potential uses of properties surrounding the proposed municipal wells, thus diminishing the worth of these properties; and

WHEREAS, current Wisconsin Statutes do not allow counties to regulate the construction and use of water supply wells to serve municipalities in adjacent counties; and

WHEREAS, the regulation of removal of water from Portage County for use by a municipality in a neighboring county is essential for protection of Portage County's environment and future economic wellbeing.

NOW, THEREFORE, BE IT RESOLVED, that the Portage County Board of Supervisors supports regulation by Portage County for any large scale removal of water from within the County for use in a municipality located outside Portage County boundaries; and

BE IT FURTHER RESOLVED, that the Portage County Board of Supervisors opposes any withdrawal of water for use by a municipality in a neighboring county without a full Environmental Impact Statement and hydrogeological study that demonstrates, with reasonable assurance, that such water removal will not have any negative impact on the groundwater levels or water quality of the watershed in which it is located; and

BE IT FURTHER RESOLVED, that the Portage County Board of Supervisors urges the Wisconsin State Legislature to enact legislation allowing counties to regulate removal of groundwater or surface water for use by a municipality or business in a neighboring county, and requiring a full Environmental Impact Statement and hydrogeological study that demonstrates, with reasonable assurance, that such ñtakingò will not have any negative impact on the groundwater levels or water quality of the watershed from which the water is drawn; and

BE IT FURTHER RESOLVED, that the Portage County Clerk forward a copy of this resolution to the Wisconsin Department of Natural Resources Secretary, the Honorable Governor of the State of Wisconsin, the Wisconsin Counties Association, and Wisconsin State Representatives and Senators representing Portage County.

Dated this 18th day of June 2002.

Respectfully submitted,

PORTAGE COUNTY PLANNING AND ZONING COMMITTEE

_____
James Zdroik, Chairperson

Harvey Olson, Member	Leif E. Erickson, Member
Ronald J. Borski, Member	Robert Brilowski, Member

APPENDIX PH

Table 1
Public Health Groundwater Quality Standards

Substance	Enforcement Standard (micrograms per liter - except as noted)	Preventive Action Limit (micrograms per liter - except as noted)
Acetone	1000	200
Alachlor	2	0.2
Aldicarb	10	2
Antimony	6	1.2
Anthracene	3000	600
Arsenic	50	5
Asbestos	7 million fibers per liter (MFL)	0.7 MFL
Atrazine, total chlorinated residues	3[2]	0.3[2]
Bacteria, Total Coliform	0[3]	0[3]
Barium	2 milligrams/liter (mg/l)	0.4 mg/l
Bentazon	300	60
Benzene	5	0.5
Benzo(b)fluoranthene	0.2	0.02
Benzo(a)pyrene	0.2	0.02
Beryllium	4	0.4
Boron	960	120
Bromodichloromethane	0.6	0.06
Bromoform	4.4	0.44
Bromomethane	10	1
Butylate	67	6.7
Chromium	5	0.5
Carbaryl	960	192
Carbofuran	40	8
Carbon disulfide	1000	200
Carbon tetrachloride	5	0.5
Chloramben	150	30
Chlordane	2	0.2
Chloroethane	400	80
Chloroform	6	0.6
Chloromethane	3	0.3
Chromium	100	10
Chrysene	0.2	0.02
Cobalt	40	8

Table 1
Public Health Groundwater Quality Standards (continued)

Substance	Enforcement Standard (micrograms per liter - except as noted)	Preventive Action Limit (micrograms per liter - except as noted)
Copper	1300	130
Cyanazine	[illegible]	0.1
Cyanide	200	40
Dacthal	4 mg/l	0.8 mg/l
1,2-Dibromoethane (EDB)	0.05	0.005
Dibromochloromethane	60	6
1,2-Dibromo-3-chloropropane (DBCP)	0.2	0.02
Dibutyl phthalate	100	20
Dicamba	300	60
1,2 Dichlorobenzene	600	60
1,3-Dichlorobenzene	1250	125
1,4-Dichlorobenzene	75	15
Dichlorodifluoromethane	1000	200
1,1-Dichloroethane	850	85
1,2-Dichloroethane	5	0.5
1,1-Dichloroethylene	7	0.7
1,2-Dichloroethylene (cis)	70	7
1,2-Dichloroethylene (trans)	100	20
2,4 Dichlorophenoxyacetic Acid (2,4-D)		7
1,2-Dichloropropane	5	0.5
1,3-Dichloropropene (cis/trans)	0.2	0.02
Di (2-ethylhexyl) phthalate	6	0.6
Dimethoate	2	0.4
2,4-Dinitrotoluene	0.05	0.005
2,6-Dinitrotoluene	0.05	0.005
Dinoseb	7	1.4
Dioxin (2, 3, 7, 8-TCDD)	0.00003	0.000003
Endrin	2	0.4
EPTC	250	50
Ethylbenzene	700	140
Ethylene glycol	7 mg/l	0.7 mg/l
Fluoranthene	400	80
Fluorene	400	80

Table 1
Public Health Groundwater Quality Standards (continued)

Substance	Enforcement Standard (micrograms per liter - except as noted)	Preventive Action Limit (micrograms per liter - except as noted)
Fluoride	4 mg/l	0.8 mg/l
Fluorotrichloromethane	3400	680
Formaldehyde	1000	100
Heptachlor	0.4	0.04
Heptachlor epoxide	0.2	0.02
Hexachlorobenzene	1	0.1
N-Hexane	600	120
Hydrogen sulfide	30	6
Lead	15	1.5
Lindane	0.2	0.02
Mercury	2	0.2
Methanol	5000	1000
Methoxychlor	40	4
Methylene chloride	5	0.5
Methyl ethyl ketone (MEK)	450	90
Methyl isobutyl ketone (MIBK)	500	50
Methyl tert-butyl ether (MTBE)	60	12
Metolachlor	15	1.5
Metribuzin	250	50
Monochlorobenzene	100	20
Naphthalene	40	8
Nickel	100	20
Nitrate (as N)	10 mg/l	2 mg/l
Nitrate + Nitrite (as N)	10 mg/l	2 mg/l
Nitrite (as N)	1 mg/l	0.2 mg/l
N-Nitrosodiphenylamine	7	0.7
Pentachlorophenol (PCP)	1	0.1
Phenol	6 mg/l	1.2 mg/l
Picloram	500	100
Polychlorinated biphenyls (PCBs)	0.02	0.003
Prometon	90	18
Pyridine	10	2
Selenium	50	10
Silver	50	10

Table 1
Public Health Groundwater Quality Standards (continued)

Substance	Enforcement Standard (micrograms per liter - except as noted)	Preventive Action Limit (micrograms per liter - except as noted)
Simazine	4	0.4
Styrene	100	10
1,1,1,2-Tetrachloroethane	70	7
1,1,2,2-Tetrachloroethane	0.2	0.02
Tetrachloroethylene	5	0.5
Tetrahydrofuran	50	10
Thallium	2	0.4
Toluene	1 mg/l	0.2 mg/l
Toxaphene	3	0.3
1,2,4-Trichlorobenzene	70	14
1,1,1-Trichloroethane	200	40
1,1,2-Trichloroethane	5	0.5
Trichloroethylene (TCE)	5	0.5
2,4,5-Trichlorophenoxy-propionic acid (2,4,5-TP)	50	5
1,2,3-Trichloropropane	60	12
Trifluralin	7.5	0.75
Trimethylbenzenes (1,2,4- and 1,3,5- combined)	480	96
Vanadium	30	6
Vinyl chloride	0.2	0.02
Xylene[4]	10 mg/l	1 mg/l

[1]Total chlorinated atrazine residues includes parent compound and the following metabolites of health concern: 2-chloro-4-amino-6-isopropylamino-s-triazine (formerly deethylatrazine), 2-chloro-4-amino-6-ethylamino-s-triazine (formerly deisopropylatrazine) and 2-chloro-4,6-diamino-s-triazine (formerly diaminochlorotriazine).
[2]Total coliform bacteria may not be present in any 100 ml sample using either the membrane filter (MF) technique, the presence/absence (P-A) coliform test, the minimal medium ONPG-MUG (MMO-MUG) test or not present in any 10 ml portion of the 10-tube multiple tube fermentation (MTF) technique.
[4]Xylene includes meta-, ortho- and para-xylene combined. The preventive action limit has been set at a concentration that is intended to address taste and odor concerns associated with this substance.

APPENDIX PI

MINUTES
PORTAGE COUNTY PLANNING AND ZONING COMMITTEE
February 4, 2004

Call to Order
Chairman Zdroik called the meeting of the Portage County Planning and Zoning Committee to order at 3:00 p.m. in Conference Room 5 of the Courthouse Annex.

Roll Call
Members present were Zdroik, Erickson, Brilowski and Borski. Member excused was Olson. Staff present were Kell, Brazzale, Semmann, Dragolovich, Schmidt, Pelky, and Slagg, Planning and Zoning Department.

PUBLIC HEARING:

Revised Groundwater Management Plan (No Action Will be Taken at This Meeting)
Zdroik read the public hearing notice as it was published in the Stevens Point Journal. Zdroik read letters of support from Faye Tetzloff, Health and Human Services Department, and Stu Grimstad, Chairman of the Water Resources Committee of the Wisconsin Council of Trout Unlimited.

Ray Schmidt, Groundwater Specialist, said he is starting out with a couple questions. Why are we doing this and why are we doing this now? These are questions Schmidt received from people over the last week. The reasons we are doing this is for human health and environmental protection. We have those responsibilities as a County and as citizens. Why now? This is not something brand new. This is a continuation of the Portage County Groundwater Management (GMP) effort that started in the mid 1980s. We are updating what was done before. The GMP passed in 1988, by the County Board with 39 recommendations. Upon passage, we started implementing them and working very diligently on programming items in the GMP through the 1990s. In the 1990s, the Stevens Point/Whiting/Plover Wellhead Protection Project complemented the County's programs. The County was more into nuts and bolts type programs and the Wellhead Protection project was in education. They did some excellent work with the farmers in the municipal well recharge areas for the City of Stevens Point, Village of Whiting, and Village of Plover, and also with homeowners in those areas. They did an analysis following the Wellhead Protection Project that showed what people had learned and what attitudes have changed. We found out we did some good, but had not done enough. In the 1990s, when most of the recommendations of the 1988 Plan had been implemented, we found that there were still problems that had not been addressed, or were continuing to get worse. Three problems that are the heart of the GMP Revision are nitrates (nitrate nitrogen in groundwater), pesticides, and groundwater quantity. Groundwater quantity was not really considered in the 1988 Plan.

In 1997, the County conducted a Value of Groundwater Survey. We randomly selected five percent of the property owners in the County. We had about a 50 percent response rate. We thought we needed to find out what the attitudes were of the people in the County. Almost 75 percent said groundwater was their number one priority (clean drinking water). An excerpt from the Value of Groundwater Survey is included in the GMP Revision. We feel we have the citizens behind us. The Comprehensive Planning Survey that was done in 2000 reflected very similar sentiments from the citizens of Portage County. In the year 2000, George Kraft wrote a document called Portage County Groundwater Conditions describing the state of groundwater in Portage County regarding nitrates, pesticides, and groundwater quantity. Based on that, County staff, Schmidt, and others went out to public meetings in various municipalities and civic group meetings. We did slide shows showing what the problems were, and what the potential solutions could be. We wanted to get people's interest up regarding groundwater and show them what was going on. At that same time, we developed the groundwater web site for the County, which has been on the internet for about three years and has a lot of information on it. In April and May of 2002, we took the draft goals and strategies to meetings around the County for citizen input. The input we received was positive. In June

2002, we brought the goals and strategies to the Planning and Zoning Committee and the Health and Human Services Board; they welcomed the information we had. In January 2003, the Groundwater Citizens Advisory Committee (GCAC) saw the first rough draft of the GMP Revision and gave their input how the GMP Revision could be made better. Today, we are here bringing the draft GMP Revision to the Planning and Zoning Committee. Copies were sent to the Town Chairmen, Village Presidents, the Mayor, GCAC members, and it is also available on the web site. On the last page of the informational handout is the County web address, Schmidt's phone number and email address for anyone who wants to provide input on the draft Plan. This past week, we had two evening public information sessions. Written comments will be accepted through February 13, 2004.

Zdroik said the GCAC members and all people involved should be listed in the Plan.

Neil Eastman, Town of Belmont Chairman, wondered what kind of funding might be available for well abandonment. Schmidt said all the recommendations in the Plan are simply just recommendations. Any of the budgeting, work plan, and staffing would have to come back before the Planning and Zoning Committee and the County Board in order to be implemented. We did hear during the informational meetings, one of the Village Presidents came forward and said that in his Village, the Village pays for the materials for well abandonment. That is something that might be considered for other municipalities. Schmidt is unsure whether the County would feel comfortable committing to any funding at this point.

Borski asked what criteria was used to know that a well needs to be abandoned. Schmidt said the figure used in the GMP Revision was based on DNR well construction reports. Anytime there was a replacement well, we knew that there was a well on a property before, and it may or may not have been abandoned. In the old days, people would keep their old wells, because we did not know what a danger they were to the groundwater and to current wells, so they were not sealed up. Some wells on the map might be sealed up, some might not, and some might still be in use. The criteria we are going to use for wanting to have them abandoned is the same criteria the DNR uses and the same as the Cities and Villages use, is if the well is not used or if it is unsafe, it would be abandoned. There are provisions in the DNR Well Code for temporary well abandonment, if you do not want to permanently seal it.

Borski wondered what the cost is to abandon a well. Schmidt said it depends on the type of well, the diameter, and depth. A driven point well might only cost about $25 for materials. A drilled well might cost about $100 for the materials. A well driller told Schmidt he charges $300. Schmidt is not sure whether that is common throughout the industry. Many well installers will offer the abandonment as a service when they put in the new well.

Borski wondered how many black dots (wells) were located on the map. Schmidt said about 2,000. That includes unused wells or wells that have been replaced. We do not know whether the old wells were abandoned. Schmidt estimates that there could actually be double the number shown. We know there are a lot of driven point wells that people install and do not bother to send us a well construction report.

Craig Corbett, GCAC member representing the Town of Grant, said Schmidt estimates 2,000 or even double that amount, but people have to recognize one thing about these abandoned wells is that they lead directly from the surface to the groundwater. This is the one point Corbett has been raising at meetings. We have to get the GMP Revision finished so people have a source for information. In the back of the GMP Revision there is a copy of the County Board Resolution that was passed regarding high capacity wells. We are hoping that the legislature is going to do something about it. Corbett has been in contact with Senator Julie Lassa's office, as well as Assemblyman Louis Molepske from Stevens Point. There is a request that there be a public hearing on high capacity wells, in the County where the well will be located. Some landowners have wells in the cone of depression of municipal wells. This can affect water levels in the private wells. Corbett lives within one mile of a cone of depression and he had to drive his well down a couple more feet, because of the pumping of the high capacity well. The City of Wisconsin Rapids bought 266 acres for its new well in the Town of Grant. They bought 106 acres to start with and put in a test well to see how much capacity there was. There was plenty of capacity. What they did not bargain for was all the iron, manganese, and hydrogen sulfide smell. They did take an option and bought another 160 acres on the east side of the site, which they say is their wellhead protection area. A company named Tonka has retested the water from this well. The test well is 16 inches in diameter. The big well could be about 16 or 17 feet in diameter. They are aiming for a lot of capacity. The Town of Grant is worried about that. The

maximum pumpage would provide about four million gallons per day. The Town does not think Wisconsin Rapids should take but half of that. This can be a problem all over the State. The Wisconsin Rapids Water and Light Commission said they would sign an agreement to protect the landowners and to work things out with the Town of Grant.

Lynn Markham, former member of GCAC who works with testing water and developing water filters, said she would like to address the cost of filling in the abandoned wells. When the company she worked for was producing the water filters, in order to reduce the levels of the pollutants we are talking about (pesticides, nitrates), you need $200 to $300 upfront just to buy the filter that hooks up to the faucet. Then there were ongoing costs for replacing filters, and monitoring it to make sure it is removing what it was supposed to remove. She would ask that when considering costs, consider (whether it be costs to municipality or private homeowner) that one well that may cost $200 to $300 that is not properly abandoned could very well contaminate many wells. In terms of the Groundwater Plan, she thinks it should be regularly updated. Put something in the GMP Revision that says the next update will be in five years. The focus of the GMP Revision in general has very good information. She would like to see significantly more focus on the strategies section. What is going to be done and what has been done about certain strategies. Some strategies on pages 83 through 89 are clearly ongoing subjects, but others can be broken down into other sections stating who is going to do what, by when, how much money will be needed to do it, and noting the results. Markham asks that the Plan go forward, but with more details.

Dick Berndt, GCAC member representing the Town of Linwood, said he is amazed at the number of citizens and groups that worked on this project. The comments at the various meetings have been very good. Berndt commented on Markham's wanting more detail for the strategies. In our Sub-Committee meetings we were tied up in all kinds of knots trying to come up with what Markham is trying to get at. We finally agreed that there is no point in doing that, if the GMP Revision will not be approved by the County. The recommendation is there, and how it will be done is up to the Planning and Zoning Department. The GCAC are not able to say who will do what, etc.

Denise Kilkenny-Tittle, citizen member on the Groundwater Management Plan and Implementation and the Public Involvement and Education Subcommittees, of the GCAC, said we did have many meetings and discussed the strategies, but also discussed who we thought, agency-wise, would lead or be the head of the strategies. Our multiple meetings are not reflected in the report. She supports Markham's comments that things like this should be added to the report. The strategies were written broadly so there is some flexibility within them. When you are proposing this to the general public, they will wonder what things really mean and what happens with each of these strategies. Some strategies need a proposed way about doing them. It does not mean you have to do it a certain way, but it might clarify the strategies better.

Chris Mechenich, who worked for 17 years as a UW-Extension groundwater educator for the Groundwater Center, said she has worked State-wide with communities that are trying to solve groundwater problems. We need this GMP Revision; worthwhile things have been done, but more needs to be done. The citizens need to give themselves more credit; they worked extremely hard, on their own time for this. Many of these strategies have been used elsewhere, so we are not talking about things that have not been tried before, but she is not aware of any significant strategies that we may have missed. These recommendations are of common sense and looking at the real problems that we have in Portage County.

Liz Langer, GCAC Chairperson, said she wants to thank the Planning and Zoning Committee for looking at the GMP Revision and also thank everyone who has worked tirelessly on this project, because it has been a long process. We realize it would be very difficult to be specific with all the strategies, because we did not know how things would get accomplished or what groups could do this or that. Langer likes the GMP Revision and supports moving it forward.

Kim Hoppenrath, GCAC member representing the Village of Whiting, said the Village is updating its nitrate removal system, and it will cost the Village over $430,000, and that is just for the equipment. They hope to have the plant up and running by April 2004. That will assure the Village that it can provide the citizens with enough water for their needs.

Chris Pehoski, Town of Stockton Supervisor, said he spent a good portion of the last five years working on the GMP Revision. He has about 10 pages of comments, which he will submit to the Committee in writing.

There are some errors in population numbers and errors on maps, but those are minor compared to the issues of the GMP Revision, and what it means for Portage County and its residents. Specific issues Pehoski wants to talk about are the costs of groundwater contamination, not only to the County, but to residents and businesses, and what it does to our economy. What kind of political perception does the County give to businesses or families moving into the area. We have a big problem here, but we are not addressing it. We are not providing any kind of funding mechanism and not looking at any kind of local action that is doable, now. On pages 64 to 65 pesticides and groundwater, we know by having some testing done in the area of drainage ditches of the Little Plover River that we have over 100 parts nitrate and 23 pesticide residues. Yet we are saying that is really not a problem, which is not addressed in the Plan. Looking at the Appendix WA, if the ordinance does well abandonment tasks as written, you can legally shut off 20 percent of the wells in Portage County because they have higher than average nitrates, you can shut off 23 percent of the wells in Portage County because of the pesticides in it, and you can shut off the Villages of Whiting and Plover=s wells because they have excessive nitrates in them (10 ppm). You have DNR regulation for pesticides leaching into groundwater, but there is nothing addressing the issue of the rights of people to have clean groundwater. The groundwater is owned by all the people of the County. It is not owned by businesses, families, or farmers. There is not any kind of economic penalty for contaminating our groundwater. On page 75, regarding the County Environmental Health Supervisor working in the Health and Human Services Department; the County Board eliminated the County Environmental Health Supervisor position, so either that needs to be corrected in this GMP Revision, or taken out completely. Pages 80 to 83 are about funding sources for goals and strategies. The GCAC has worked for nothing for five years on this project. There is no funding for these things, and Pehoski=s fear is that the GMP Revision will sit on a shelf somewhere. When businesses come to town and want to know what we are doing about groundwater, all we do is pull this off the shelf. This has to go beyond sitting on a shelf. Pehoski attended one of the public informational meetings, and an issue came up about using the term organic and sustainable agriculture. Since the Federal Government took over the process of regulating organics, people can refer to the National Organic Program or the National Organic Standards for the definition on that. There are thousands of definitions for sustainable agriculture. Pehoski read a definition for sustainable agriculture from a book from the University of Minnesota: ñIt is a system of agricultural production that supplies the necessities of the present without compromising or polluting the resources of the future.ò The GMP Revision mentions buying conservation easements or buying land. Pehoski thinks that would be the best and cheapest long-term strategy or approach to use. Then you will be taking some of the land closest to the City or the Village well fields out of production and turning it into a nice natural border. Pehoski reviewed the Value of Groundwater Survey from 1996, which he feels is out-dated. A new survey is needed. Pehoski said he supports the Plan and to move it forward.

Jim Wysocki, Town of Sharon farmer and member of groundwater quantity and quality groups, said Section 6.11 (2)(c) talks about combining of detects. These things need to be scientifically based. The mode of action of a chemical makes a difference. When combining two products with similar modes of actions, that is scientifically sound. Combining something for the nervous system of a pest versus something that works on its digestive system, are two different modes of action. This has to be more science based. That same process is taking place with creating standards with the Food Protection Act (FPA), which was passed nationally, and the Environmental Protection Agency=s (EPA) re-registration process of all agricultural chemicals. There is a system that EPA looked at that utilized a ñrisk cupò technology. It says regardless of what the product is used for, the exposure to humans should be below a certain level. Then they add up all the various uses and make their determination before releasing the product, whether or not there is more exposure out there currently or not. That is a very good, broad-based system of doing it, with multiple safety factors built into the analysis; with 10 fold multiplication for children, an additional 10 fold multiplication for people who use or need more of a product than the average person, and another 10 fold multiplication for people more sensitive than the average person. That results in 1,000 fold multiplication of the safety factors. There are a lot of safety factors in there. Some comments in Section 6.12, talk about a negative environmental standard. If you are below the preventive action limit, but it still causes negative environmental impacts, then it should be reduced or eliminated as well. That is a vague concept. Wysocki understands the GCAC coming out with vague concepts, but when it gets to regulations, which are the Planning and Zoning Committee and County Board=s issues, you can not be vague or this whole issue will be nothing but a court case. Worst case scenario puts in effect zero tolerance on everything. Zero tolerance is impossible to obtain on certain chemicals. Section 6.13 says to ñavoid human-influenced depletion.ò Does that include drinking water for a house? Technically, that is a human-influenced depletion of the groundwater. The use of water will cause depletion, but is it causing damage would be the question.

Is it the standard of anybody using the water, though Wysocki does not think that is what the intent is, but the regulation needs to be more specific; what amount of water can be used. Section 6.28 Negotiate with Corporate Food Processors Regarding Pesticides and Nutrients Required for Grower Contract, was brought up at both public informational meetings. As a farmer, he is not aware of any processor requirements on fertilization or chemical use. That is something that should be thoroughly checked out. Section 6.25 Local Pesticide Reporting does not address the uses by homeowners. Some store bought chemicals are not even allowed for agriculture. Most of it is the same chemical technology. Without proper training, over application is most likely to occur on a small scale use like spraying rose bushes. You are missing a very large area of regulations (that should be regulated) by ignoring residential use. Section 6.30 talks about organic and sustainable agriculture. Wysocki has sat on several committees where recommendations were made, because it would be sustainable, and it made people cringe that the Wisconsin Windshed Partnership said increasing the tillage will increase the wind erosion. With everything in life there are trade offs. Reduced yield can increase the amount of farmland required. If you say we will just import it, now you are on a world-wide basis and are clearing tropical jungles to get more productive land. It is important that the entire balance be calculated, not just a localized one in one area. As to Corbettôs comments, Wysocki agreed with most of what Corbett says, other than when it comes to the County line issue. Groundwater needs to be managed by a watershed recharge area. The groundwater does not know it goes over County lines. Wysockiôs farm is within two miles of the site stated by Corbett. Wysocki has two, 40-acre fields on each side of County Road U. We pump water from Wood County into Portage County to irrigate the field on the other side. We also do that between Wood and Juneau Counties, between Waushara and Adams Counties, and between Portage and Waushara Counties. Water does not recognize governmental jurisdictions. Regulations should be based on the Wellhead Recharge Area. If County Road HH was the border between Waupaca and Portage Counties, would we say only Waupaca has anything to say about the Whiting Recharge Area? He is concerned with the resolution that says he needs an environmental impact study to irrigate two fields on two sides, because he owns property over a County line.

Liz Langer read the following on page 87 Ongoing Public Education: In addition to general groundwater educations programs, specific programs are under development with the assistance of UW Extension to: Educate Rural and Urban Homeowners Concerning the Impacts on Groundwater of Septic Systems and Lawn and Garden Fertilizers and Pesticides, and also, Educate Operators of Businesses and Institutions Regarding Groundwater Impacts from Landscape Practices, and Chemical Storage and Use. Langer thought these issues were addressed.

Langer said there is some data from the University of Wisconsin that indicates that the synergistic effects of chemicals can have a significant impact on peopleôs health than each chemical taken individually.

Borski asked if other Counties have any type of groundwater plan. Schmidt said he is not aware of the surrounding Counties having plans. Each will have some groundwater related strategies, with some initiatives, but not a County-wide plan.

Bill DeVita, environmental chemist at the University of Wisconsin Stevens Point and Portage County resident, said in Section 6.11 (c) regarding multiple pesticides, DeVita agrees that it would be nice to have scientific based studies on all these chemicals that are being used, but we do not have enough information. The question is are we going to allow ourselves to be test subjects for future demographic studies down the road for illnesses in our County, or are we going to take action right now and establish some guidelines. The State and Federal guidelines are not there for many chemicals. NR140 regulates contaminants in groundwater; looking down the list, there are very few pesticides that are actually regulated. In looking at the EPA ñrisk cupò DeVita does not know whether all these pesticides and their metabolites are being evaluated. DeVita spoke Thursday evening at the public informational meeting and presented information on what the European Union does. In terms of regulating total pesticides in groundwater, they have drinking water goals set at one part per billion total pesticide residues, which is actually ½ part per billion because they set a standard of .10 parts per billion for any individual pesticide. Their goals are very stringent. In Section 6.11 (3)(a), you have areas where pesticides were detected in groundwater, but the pesticides do not have established groundwater standards. Section 6.11 (3)(b) indicates enforcement standards established for similar pesticides. DeVita is not sure what similar means. Is it an unregulated compound? How is it established? Schmidt said the idea behind that was to look at the health effects on humans in modes of actions for similar types of pesticides. There has not been a specific one set. That would be

developed as each strategy is developed. DeVita added, as a resident of Portage County, he is not willing to wait for the State or Federal government to set drinking water standards for all these chemicals.

Zdroik said keep in mind that the Planning and Zoning Department will be accepting comments until 4:30 p.m., February 13, 2004. The GMP Revision will be forwarded to the County Board shortly. Schmidt said it is our intentions to incorporate comments as they are appropriate, and we will accept all comments and answer comments or questions. If a comment is not incorporated into the GMP Revision, we will give a reason why it is not incorporated.

Borski asked whether all the comments received today and from the informational meetings, will be incorporated into the GMP Revision. Schmidt said, no; we will address all the comments, and some will be included. For those not included, we will provide a written statement as to why it was not included. This effort took several years to get to this point, we are not going to put something in it that is not appropriate. Kell suggested having a ñhearing sectionò where all the comments would be compiled.

Adjournment

There being no further business to come before the Committee, Zdroik moved to adjourn. Erickson seconded the motion, which passed unanimously by a voice vote.

_____	_____	_____
S. Dragolovich, Recording Sec.	James Zdroik, Chairman	Date

Memo

To: Portage County Planning and Zoning Committee

From: Mike Carder, R.S.

Re: Groundwater Management Plan Revisions

Date: February 12, 2004

Please enter these written comments into the public record of testimony regarding the Groundwater Management Plan Revisions dated January, 2004.

My overall impression of this document is that it was compiled in a deliberate, thoughtful and professional manner. Many community members donated time, effort and expertise during the process. The P&Z Committee and the entire county should be proud of this rather unique plan which reinforces Portage County's status as a leader in groundwater protection in Wisconsin.

What struck me right away as I read the plan were the numerous references to "public health" and "human health". As the Environmental Health Supervisor for the Portage County Health Dept. for 15 years, I always considered groundwater protection to be the top environmental health issue in the county. But with the elimination of the EH Supervisor position, I'm fearful that interest in this very important issue will evaporate in the Health and Human Services Dept. The county staff charged with protecting the public's health must take an active role regarding groundwater protection.

Recommendation #1
The county Health Officer and Health and Human Services staff must support and help implement the plan on a daily basis. A report of their activities should be submitted to the Health and Human Services Board and the Planning and Zoning Committee at least annually.

On page 39, the plan says "Portage County may want to consider applying for the authority to regulate septage disposal, if the WDNR is found to be performing this task inadequately. The DNR only has one person to monitor a five county area (including Portage) for all landspreading activities." My experience with this issue over the years tells me that one DNR staff person cannot keep track of 7.2 million gallons of septage generated annually in this county, let alone four other counties.

Recommendation #2
The county should assume responsibility for approving and spot checking septage landspreading sites if a funding mechanism can be identified.

Regarding the proposed Private Water Systems Ordinance (Appendix WA), I believe that the Planning and Zoning Dept. and the Health and Human Services Dept. should have joint administration, as mentioned on page 86. Without the investment of time by the field sanitarians in HHS (and the enforcement authority), the goal of well abondonment may not be realized for a long time.

Recommendation #3
Adopt the Private Water Systems Ordinance, with adoption of Level 5 of the DNR Well Code (well abandonment). Incorporate language which would give P&Z and HHS joint administration.

As a member of the Groundwater Management Plan Implementation Subcommittee, I saw the substantial commitment made by citizens who were trying to maintain and improve our quality of life. The best way to recognize their efforts and prevent the deterioration of human health, the environment, economic growth and property values is to adopt this plan and strongly support its adoption by the County Board. Thank you.

<Denise.Kilkenny-Tittle@uwsp.edu>

02/13/2004 04:06 PM

To <Schmidtr@co.portage.wi.us>

cc

bcc

Subject PC GW management plan draft comment

Ray,

I just wanted to put my verbal comments in writing. I am in support of approving the Portage County Groundwater Management Plan. However, I would like to see Section 6, Recommendations expanded. I do not think this section captures all the work, energy, and thought that went into making the list of strategies. I believe the current list of strategies is too vague and each strategy should have more information. One way to do this is to develop a simple work plan of who, when, how, and how much (estimated costs) for each strategy. This work plan would be similar to writing a grant. What do you plan to do? However, there should be a clause that states that this is a proposed plan or suggested ideas that may or may not be actually implemented as written. This would allow flexibility in actual implementation, but the information would give the "reader" a better idea of what the strategy entails.

At the very least, a short narrative explaining the "why" of each strategy should be included. What I mean by this is why did the committee suggest this strategy, what was its purpose, what was its importance, or what did you hope to gain from implementation of the strategy? Let's take the pesticide database as an example. This strategy was recommended to gather data that may help meet the pesticide goal. The committee suggested this strategy because the County lacks information on the actual pesticides that have been and are currently being used in the county. The County wants to track the pesticides that leach to groundwater, so future research can be targeted in the correct area(s). The pesticide database could include information such as what pesticide(s) were and are used, estimated total quantity per year, and location (maybe to the ¼, ¼ section). This database is not meant to be (or need to be) a detailed application log. Historical and current pesticide application information is requested. (More could be written, but hopefully this gives you an idea.)

Thank you for considering these comments.

denise

Denise Kilkenny-Tittle
1408 North 2nd Drive
Stevens Point, WI 54481
715-341-6547

February 4, 2004

Ray Schmidt
Portage County Planning and Zoning Dept.
1462 Strongs Ave.
Stevens Point, WI 54481

Dear Mr. Schmidt,

As a resident of the Town of Hull in Portage County, please accept my comments regarding the revised groundwater management plan submitted January 2004.

Overall, I think the plan is very informative with a good basis of material that identifies the fragility and utility of groundwater in Portage County. The recommendations in Section 6 contain some sound initiatives that are well founded considering the vulnerability of the Central Sands aquifer to pesticide contamination. I am sure you will be reminded of the economic benefit the agricultural industry provides to Portage County, and that these benefits come with a cost in environmental degradation. However, groundwater is a public resource, owned by the residents of the county, not by one interest. The agricultural community must see these recommendations for what they are – goals. They are simply goals that I hope we can all agree benefit everyone in the county. I cannot imagine anyone with knowledge of groundwater quality in some parts of our county to allow their children to drink the stuff.

I do not think it is wise to wait for state or federal officials to develop health advisory levels for all contaminants or combinations of contaminants. The fact is they cannot keep up with the agricultural chemical industry's production in developing health based drinking water standards. With this in mind, the Portage County Water Quality Specialist, along with the Groundwater Citizens Advisory Committee must develop a mechanism to provide guidelines that will be used until the State Division of Health or U.S. EPA establish such standards. Considering the resources available to you, the Planning and Zoning Department, and the GCAC, it cannot be expected that you or your department establish toxicologically based standards on pesticides, pesticide metabolites, or combinations thereof. The most practical method of establishing such guidelines is to sum pesticide residues as recommended in Section 6.11. With the highlighted revisions, to eliminate ambiguity, I support such a guidance that states, as suggested in the proposed management revisions 6.11.2c, "where multiple pesticides are present below their individual enforcement standards in groundwater, the sum of all pesticide residues (including pesticide metabolites) should not exceed the most stringent enforcement standard for any of the individual pesticides detected".

Summation of pesticide residues is not without precedence. The European Union has set drinking water goals at 0.1 μg/L for an individual pesticide and 0.5 μg/L for total pesticide residues. Considering the economic benefit the agricultural industry provides to Portage County, the recommendations of section 6.11 seem to be a reasonable compromise. Again, these are goals.

Another guidance system proposed is the use of the "risk cup" which is being developed by the U.S. EPA under the Food Quality Protection Act. Under this system, EPA must consider the cumulative effects of all pesticides with a common mechanism of toxicity. EPA must combine the risks of dietary exposure resulting from the pesticide's use on food crops with the risks of residues that might be found in drinking water and residential use. It sounds like the EPA is on the right track with developing these standards, but until they are established, with teeth to enforce; we better have some other guidance to rely upon.

There are some problems associated with a "fractional" enforcement standard guidance, which may allow for summing the total fraction of the groundwater enforcement standard. Such a system is proposed as follows. Identified pesticide applications in a given area would cease if the sum of the fractions exceeds 1. For example, total chlorinated atrazine residues (TCAR) ~~are regulated at 3.0 µg/L and metribuzin at 250 µg/L. If TCARs are~~ found at 2.0 ppb (accounting for 2/3^{rds} of the enforcement standard) and metribuzin at 83 µg/L (1/3rd of the enforcement standard), then the sample would be above the guidance. This system does not account for any synergistic effect that may be presented by the chemicals.

Wording in section 6.11.3 regarding "similar pesticides having groundwater standards" is vague. For example, is metolachlor ESA "similar" to metolachlor? Does its standard rely on that of metolachlor, or alachlor ESA (interim standard)? Adding total pesticides with metabolites as suggested for section 6.11.2c will alleviate much uncertainty of drinking water goals.

The management plan cites a 1995 DATCP study that determined that 15% of the county's private well are contaminated with alachlor ESA. How many samples were taken at this time to come up with 15%? Considering the extent of what we know about this and other chloroacetanilide herbicide metabolites, and their presence in eastern Portage County groundwater, I would strongly recommend an initiative to get the DNR Division of Health to establish health based standards for these compounds. Then a survey of Portage County wells would have some additional rationale. A survey of Portage County wells (as was done for atrazine in the mid-90's) needs to be revisited for atrazine and the chloroacetanilide herbicide metabolites. Because I have a conflict of interest with the testing, I will leave it at that for you and the GCAC to decide how to obtain funding and where to go for analysis.

Some random notes regarding items in the groundwater management plan:

The Environmental Task Force Lab at the University of Wisconsin – Stevens Point is now known at the Water and Environmental Analysis Laboratory (see p. 79, 86 paragraphs 3 and 6).

The Central Wisconsin Groundwater Center is now known as Center for Watershed Science and Education (p. 86. paragraphs 3 and 6).

Pesticides should be defined somewhere that you are speaking not only of pesticides, but also pesticide metabolites, whether or not regulated by NR 140.

Section 4, under pesticide pollution, should state "Atrazine is the largest known pesticide problem, occurring in 40% of wells (maybe cite the survey conducted in the mid-90s).

Page 57. "Alachlor ESA, one of the degradation products of the pesticide alachlor, is probably a common pollutant. A DATCP study found that 15% of wells tested in central Wisconsin contained this compound (DATCP, 1995, a survey of atrazine in Wisconsin groundwater). Some controversy existed over the level at which alachlor ESA should be regulated. The Wisconsin Division of Health has recommended an interim 20 parts per billion Health Advisory Level." A DATCP survey in 2000 detected the presence of Metolochlor ESA and Alachlor ESA in Stevens Point municipal well #10. You might want to mention the presence of other chloroacetanilide herbicide metabolites have been detected in some areas of the county, and also that a countywide assessment has not been performed.

Good luck finalizing the management plan. If you have any questions, comments, or if I can be of any assistance, please contact me at 346-3753 or the address below.

Best regards,

Bill DeVita
1463 Torun Rd.
Stevens Point, WI 54481

(These comments were submitted anonymously. Received by Ray Schmidt on February 10, 2004)

Innovative manure anerobic digestion, such as that operated by Gordondale Farms of Nelsonville, can greatly decrease the amount of manure that must be stored. The digested manure fiber can be reused as animal bedding. During digestion, methane gas is generated and used to produce electricity thus reducing green house gases released to the atmosphere. The remaining effluent with greatly reduced odor must still be stored until it can be landspread.

Page AD-7
Many comments in 4 have no place in an excellent professional document like this.

I suggest great restraint in requiring farmers to report pesticide uses just because of the DATCP rules regarding records. We have moved past most of the questionable pesticide use with much more stringent approvals.

Did I miss it or was lawn fertilization and pesticide use omitted? The ground water management plan has a huge hole in it without addressing this.

Sampling—private rights considerations?

1563 County Road ZZ
Amherst Junction, WI 54407
July 7, 2003

Jim Zdroik, Chair
Planning and Zoning Committee
Portage County Board of Supervisors

Dear Jim,

Trout Unlimited wholeheartedly supports the proposed updating of the Portage County Groundwater Management Plan, as presented, and applauds the broad-based cooperative efforts behind this initiative. The common sense goals and strategies set forth in this plan attempt to provide the basis for the sustainable use of Portage County's all-important groundwater resources.

Clean and abundant groundwater, besides serving critical human needs, is essential to healthy ecosystems. Central Wisconsin's highly valued natural resources include its deservingly well-known trout streams, which rely on constant and adequate sources of high-quality groundwater for their very existence. Portage County can take great pride in this effort to preserve the very foundation of the health of its citizens and its natural habitats.

In keeping with the mission statement of Trout Unlimited, *"To conserve, protect and restore North America's coldwater fisheries and their watersheds"*, we congratulate the agencies and citizens of Portage County for this outstanding example of responsible stewardship.

Sincerely,

Stu Grimstad

Stu Grimstad, Chair
Water Resources Committee
Wisconsin Council of Trout Unlimited

DEWITT
ROSS & STEVENS S.C.
LAW FIRM

www.dewittross.com

Capitol Square Office
Two East Mifflin Street
Suite 600
Madison, WI 53703-2865
Tel 608-255-8891
Fax 608-252-9243

West Office
8000 Excelsior Drive
Suite 401
Madison, WI 53717-1914
Tel 608-831-2100
Fax 608-831-2106

Please respond to: Capitol Square Office
Direct line: 608-252-9325

February 13, 2004

VIA FAX (715) 346-1677
AND U.S. MAIL

Mr. Chuck Kell
Director
Portage County Planning & Zoning
1462 Strongs Avenue
Stevens Point, WI 54481

Mr. Raymond C. Schmidt
Water Quality Specialist
Portage County Planning & Zoning
1462 Strongs Avenue
Stevens Point, WI 54481

RE: Comments of the Wisconsin Potato & Vegetable Growers Association on the Proposed Portage County Groundwater Management Plan Revision

Dear Messrs. Kell and Schmidt:

We have been asked by our client, the Wisconsin Potato & Vegetable Growers Association ("WPVGA"), to review the Draft Groundwater Management Plan for Portage County (the "Plan").

The WPVGA is a trade association made up of 144 Wisconsin producer members. The WPVGA is particularly concerned about the "Recommendations" in the Plan regarding reporting of pesticide sales and use, and local pesticide regulation, which are contained in Section 6.0. Our comments are as follows:

A. The Development of Local Pesticide Regulations is Illegal

Although we do not believe that the Plan recommends that Portage County develop its own, unique pesticide regulations, in Section 6.11 the Plan makes specific suggestions with regard to acceptable levels of pesticide in certain areas. We are not sure if these recommendations are a reflection of existing statewide standards, or if they are new, Portage County-specific proposals, but we remind you that development of local pesticide regulations is illegal under Wisconsin law, except under specific

circumstances.[1] Under Wis. Stat. § 94.701, a city, village, town or county **"may not prohibit the use of or otherwise regulate pesticides."**

This statutory provision was added to Wisconsin law in order to preserve an agricultural producer's ability to have one set of Wisconsin standards, rules and guidelines with regard to pesticide use and application that would apply to their operations regardless whether their fields crossed over county or municipal lines. As you know, pesticide sales and use is heavily regulated in the State of Wisconsin under Wis. Stat. ch. 94, Wis. Admin. Code § DATCP 29, 30 and 31, and other Wisconsin laws.

We urge you to keep § 94.701 in mind as you develop additional strategies with regard to pesticide use and sales in Portage County.

B. The Development of a Portage County Agricultural Pesticide Reporting Database Will Economically Disadvantage Portage County Farmers

Section 6.25 of the Plan advocates the creation of a Portage County Agricultural Pesticide Reporting Database. The development of such a database could financially disadvantage Portage County farmers and result in significant management expenses for Portage County. It would single them out from all other growers in the State (and maybe the United States) and bring an increased level of scrutiny, whether deserved or not, to their production practices. After several years of study, the State of Wisconsin has never created a pesticide database. One of the reasons this project has not advanced is due to the high expense of administering the program.

In addition, the creation of this "agriculture-only" database presumably excludes all other commercial, municipal and residential pesticide application. Accordingly, this database would not collect information on pesticide application in city parks, residential lawns or schools, which are all places where children have direct contact with the surfaces treated with pesticides. If your concern is educating the public regarding the use of pesticides in Portage County, then limiting the collection of data to just agricultural areas will produce inaccurate, one-sided results.

We urge you to reconsider the inclusion of a Portage County Agricultural Pesticide Reporting Database as a goal in this Plan.

[1] Note: There are eight exceptions to this general rule. *See* Wis. Stat. § 94.701(3)(b) (2002).

C. A Statewide Pesticide Reporting System Must Be Uniform and Collect Data from All Sectors, *Not* Just from the Agricultural Sector

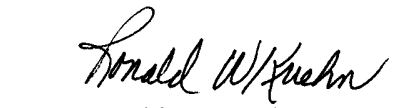
In Section 6.29, the Plan urges support of a Statewide Pesticide Reporting Database. As you know, a pilot project designed to evaluate the feasibility of the creation of such a statewide database is authorized under Wis. Stat. § 94.695. It is critical to the economic viability of agricultural in Wisconsin and critical to the accurate collection of scientifically useful data that *any* statewide database collect pesticides sales and use information from both agricultural and non-agricultural areas. This database must report the types and levels of pesticides applied to every school playground if it reports the types and levels of pesticides applied to every potato field. As noted above, this concept was studied by a working group at the Department of Agriculture, Trade and Consumer Protection for more than one year and has never developed into a statewide program.

We urge you to amend Section 6.29 such that is supports a *uniform* statewide pesticide reporting system that will collect information on pesticide sales and use from all areas of the state and from all types of applications, whether agricultural, municipal, private or commercial. Most Wisconsin citizens come in contact with pesticides on their neighbor's front law, in parks or in school athletic fields.

If you have any questions regarding our comments on the Plan, please contact me directly at (608) 252-9325.

Sincerely,

DEWITT ROSS & STEVENS s.c.



Ronald W. Kuehn

RWK:jkl

February 3, 2004

Portage County Planning and Zoning Committee
1462 Strongs Avenue
Stevens Point, WI 54481

Dear Members of the Planning and Zoning Committee,

Thank you for this opportunity to comment on the draft groundwater management plan. My name is Lynn Markham. I live in Stevens Point, was previously a member of the Portage County Groundwater Citizen Advisory Committee, and have worked testing drinking water and developing household water filters. Groundwater is a crucial local resource. Our health depends on it, and once contaminated it's extremely difficult and costly to restore.

Related to the draft groundwater plan, I have two main points that I would like to cover today.

First, I think the County groundwater plan, like any other plan, should be regularly updated to provide current information to all people and organizations interested in groundwater. Regular plan updates could also lessen the amount of time that the Groundwater Specialist spends answering individual questions. Therefore, I recommend adding a sentence to the introduction of the 2004 plan stating that the next plan update will be in 2009. I feel a five year interval between plan updates is more timely and efficient than the 16 year interval that has passed since the last update.

Second, I recommend restructuring the "Strategies" section located on pages 83-89 of the draft. I find this section too vague to provide a clear picture of what has been done to date and what will be done in the next few years. While some strategies, such as permitting new POWTs, are truly 'ongoing', others are discrete or can be made so. Under each discrete strategy, I suggest identifying and prioritizing specific, measurable tasks together with who is responsible, what resources are needed and briefly describing the results. Using the following table, or something similar, may be helpful in organizing this information. The recommendations in Appendix RE "Status of Groundwater Management Plan (1988) Recommendations" should also be included in this section, in the same format, to provide a complete picture of what has been accomplished and what is yet to be done.

Strategy: Conduct drinking water education programs for communities.

Task	Complete (Yes/No & date)	Responsible person	Resources needed	Date to be completed	Results
Develop and deliver a presentation in SE Portage County about groundwater quality changes in the last 5 years and management options	Yes (6/03)	Groundwater specialist & local sponsors	$100 for advertising and printing handouts	June 2003	40 people attended a 2 hour presentation at the Belmont Town Hall on 6/8/03.
Develop & distribute homeowner packet describing groundwater concerns and treatment options. Content guidance from PCGCAC	No	Groundwater specialist and UWEX CNRED educator	$1 per packet for printing and assembly and postage (~$200/yr); address list of new rural property owners from Register of Deeds	November 2004	

Additional specific recommendations:

- Page 1: First paragraph, last sentence. "As with all programs of this type, conclusions, recommendations and plans of action will need to be updated in future years as our knowledge of groundwater resources and management techniques grows."
- Page 1: Section 1.1, third paragraph. Replace "citizens" with "residents" here and throughout the document because not all people drinking groundwater in the county are actually citizens.
- Page 26: Add two columns to table 3.5: 'County population served by POWTs' and '% of total county population served by POWTs'. Draw a conclusion about how the population served by POWTs has changed and where new residential growth is occurring in the county.
- Page 39: Under section 3.15, state the current acreage of certified organic land and insert a table of commonly grown crops with the toxicity units of pesticides per acre.
- Page 78: Under "The County Subdivision Ordinance" define what is meant by "acceptable water quality"? Does this mean that no MCLs are exceeded? If it is less

stringent, explain why. Also include this information on page 85 under "Drinking water quality for new residences."

- Page 86: Update the ETF lab with their current name.
- Page 87: Under "Ongoing Public Education," add two items.
  - Develop educational materials for potential homeowners about factors to consider prior to moving to the country. This piece could include information ranging from rural drinking water issues to septic systems to snow plow service and beyond.
  - Develop and distribute educational materials describing the fact that Comm 83 does not protect groundwater from nitrate contamination. Encourage future homeowners to install POWTs to protect the groundwater from nitrate contamination to protect their own well and neighbors' wells.

In closing, I ask that you revise the groundwater plan based on the comments submitted and recommend County Board adoption. Thank you for this opportunity.

Sincerely,

Lynn Markham

Lynn Markham
1748 Briggs St.
Stevens Point

11 FEB 04

re: Suggested corrections to the Draft Portage County Groundwater Management Plan, dated January 2004

To: Portage County Planning and Zoning Committee

The following suggestions are submitted for corrections and or clarification to the Draft Portage County Groundwater Management Plan dated January 2004. For ease of understanding, I have used the following format:
Page of comment, start and end of the part of the plan commented on.
Comment and/or clarification.

Page 11: Figure 2.6, Page 13: Figure 2.3, Page 20: Figure 2.5, Page 27: Figure 3.9 Page 28: Figure 3.4, Page 31: Figure 5.3, Page 33: Figure 3.6, Page 35: Figure 3.2, Page 37: Figure 3.10, Page 38: Figure 5.1:
These maps are out of order from the text, and out of order from the Sections of the Plan that they represent.

Page 25: Table 3.6, Much of the growth in the ... within the Sewer Service Area:
How is this growth determined and/or directed? What types of checks are in place so that the groundwater is not further compromised with this growth?

Page 25: Table 3.4, Portage County Population (2000):
Speaking only for the Town of Stockton, these numbers do not match the Census data. Are the others correct?

Page 28: Figure 3.4 Pipelines:
Several pipelines are missing in this data: North of Cty J by Hwy 10 to Cty HH is one of them. This line consists of Natural gas in one 6 inch and one 8 inch line.

Page 31: On-Site Wastewater, Figure 5.3:
This map should be in Section 5. Where is the data to support that these systems are failing, and what type of data was used to determine this?

Page 33: Figure 3.6 Wells to be abandoned:
Where is the data to support the finding that these wells need to be abandoned, what type of data was used to establish these criteria, and who will pay for the abandonment and the replacement of these wells?

Page 34: Section 3.9 In 2000, Portage County placed a moratorium ... before it is discharged to groundwater.:

Do not the comments on the newer types of POWTS referred to in Comm 83 also apply to the usual and customary types of POWTS that are already in use in Portage County? All POWTS need to be properly sited and maintained. What has Portage County achieved by using this moratorium? What standards of use or placement have changed?

Page 34: The Villages of Nelsonville .... Private wells are subject to high nitrate levels.

Aren't these wells also more prone to higher bacterial counts?

Page 36: Section 3.10 Landfills

Why has there not been systematic sampling done near the old dump sites? Is it because that may be a potential liability to the Town, Village, City or the County? These dumps were not lined.

Page 39: Section 3.14 Agricultural Chemicals-Nitrate Nitrogen

There is data that has come out in some of the Groundwater Citizens Advisory Committee meetings from research that the university (UWSP) is doing, that show in excess of 100 ppm N and 23 trace agricultural chemicals in the surface water in the ditches flowing into the Little Plover River. Why is this not mentioned in this report?

Why are not dollar figures given for the cost of removing nitrate from the City, Plover and Whiting well fields? At the Public Hearing on 04 FEB 04 in front of the Portage County Planning and Zoning Board, The Village of Whiting stated that it is costing them $430,000.00 to update their nitrate removal equipment. What are the actual costs to the people of this County, to let a few profit at the expense of the all?

Page 39 and 40: Agricultural Chemicals—Pesticides

Thank you for including the effects of synergism in this document. There are all kinds of reports out of the European Union, New Zealand, and Australia to document these effects. I think that this section needs to be worded more strongly. In Table 4.1 (Page 47 and 48), an additional section should be added to the text for those chemicals found in drinking or test wells in the County, not just for the chemicals used on crops.

Page 41: Pesticide pollution also affects large ... data are lacking:

Why hasn't this data been compiled? We know what is happening in a general sense, why are we so chaotic in getting to the specifics?

Page 43: Figure 4.8, Page 44: Figure 4.9, Page 45: Figure 4.10

There is mention made in the text about the Little Plover River, the Plover River and Lake Emily, but no mention is made of the Figures 4.9 (Bancroft) and 4.10 (Tri-County). Where are these located at and what is going on with them?

Page 49: Radionuclides are elements ... similar to that conducted for atrazine in the mid-90's, has been conducted in Portage County.

Why hasn't follow up testing been done if radionuclides are such a public health issue? How many wells west of the river have been abandoned because of high radioactivity? Where do the interests with the abandoned wells get their water?

Page 52: For several reasons ...leachable pesticides have been reaching groundwater where they have been used.

Why it is "impossible to determine the amounts of specific pesticide residues present in Portage County groundwater"? We know what is being used and in very general areas, where. Give the specific reasons. This needs to be worded stronger instead of brushing it aside.

Page 54: Figure 4.3

What do the yellow dots mean?

Page 62: Bureau of Waste Management

Also: See page 36 comments. What steps need to be taken by the County, City, Village or Town to have the BWM investigate whether old dumpsites are impacting groundwater quality? How are these sites cleaned up if they are found to be impacting the groundwater?

Pages 64, 65, and 66: DATCP

Local actions taken by DATCP and the DNR need to be specifically mentioned and detailed in this section.

Page 72: Department of Transportation

There is no mention of the Wisconsin DOT's practice of ditching highway runoff directly into the waters of the State. In Portage County, the Tomorrow River, Little Plover, Plover, Lost Creek, Mill Creek, several lakes and various wetlands are used by the DOT as a dump for highway runoff. This runoff includes petroleum distillates, salts, and other chemicals normally regulated.

Page 78: It is very difficult to isolate ... to protect natural areas and open spaces.

This does not address the issue of the public waters of the state being contaminated by a few for profit. Private landowners are made to financially suffer losses while the parties responsible for the contamination walk free.

Page 79: Generally, samples taken under this provision ... including pesticides which may never have been used in a specific area.

See Page 78 comments above. Why is there not a surcharge placed on the use of pesticides to fund testing for and sampling of wells that may or are

contaminated? This would put a direct financial burden on the user of those chemicals.

Page 79: The County Human Health Hazard Ordinance

The County Health Supervisor position has been eliminated. I suggest that the wording in this section be replaced with the responsibility being transferred to the Staff of the County Health and Human Services Department.

Page 80: Section 5.2.2 Local Government Regulation

Where will the funding source come from to provide the oversight and development of abandonment/replacement of unsafe or unused wells?

Section 5.2.3 Political and Educational Institutions

The Committees are composed of members that do not get paid. The County needs to procure or self-fund the implementation of the goals and strategies, provide funding for the testing and/or replacement of wells, and move forward with protecting our groundwater resources.

Page 86: Establish Well Abandonment Program in Portage County

Funding for this needs to be addressed. If Ordinance WA (page WA-3 specifically) is passed as written, over 23 percent (refer to page 41) of the wells in Portage County can be legally shut down and abandoned. Who is responsible for the replacement drinking water source and associated costs?

Page WA-4: Remove the Planning and Zoning Department from the water quality enforcement provisions of this proposed ordinance. As written, there is no over-seeing body or outside "influence" for a safety check. A suggestion would be to work tightly with the Health and Human Services Environmental Health Section.

Also, the type of proposed appeals process that is suggested does not have objectivity. The inspection, enforcement, and appeals process is all done by one department.

Page 87: Develop a Portage County Agricultural Pesticide Reporting Database

The testing of drainage ditches flowing into the Little Plover River show 100 ppm Nitrate and residuals of 23 agricultural pesticides. What do you mean, this data, or where to test, is not commonly available?

Page 88: Encourage Organic and Sustainable Agriculture

A lot of discussion has been generated in the Public Hearings by these four short sentences. Most of the discussion has revolved around the definition of the terms of Organic and Sustainable, and not about the use of these practices.

Organic is now defined by the Federal Government in the National Organic Program (NOP) and by the National Organic Standards Board (NOSB). I suggest that these be referred to.

Sustainability has thousands of definitions, and I offer one from the University of Minnesota; Department of Soil, Water, and Climate; Rhizobium Research Laboratory:
"A system of agricultural production that supplies the necessities of the present without compromising or polluting the resources of the future."

This is what we are trying to do with this Groundwater Management plan, isn't it?

Page 89: Negotiate Conservation Easements - Buy Land

This is the cheapest long-term solution for this persistent problem that we are reluctant to address in many other ways. Admittedly, it is only a viable solution for the most densely populated areas of our County.

Page VG-1: Value of Groundwater Survey

This survey is 8 years old. Are the results still applicable to what the people of this County see?

Page AD-7: Conclusions

Do we wait till the Groundwater quality becomes so poor that we cannot use it safely?

Whether or not the above-suggested comments, clarifications and changes are made to the proposed Groundwater Management Plan, it is necessary to pass this plan for the protection of groundwater quality and quantity. Funding mechanisms are not in place for the implementation of this plan. The County would be remiss in their duties by not providing funding for a plan that they pass.

It is my hope that this plan will not sit on a shelf in the Planning and Zoning office and be used for its political and economic benefits to the County. This plan is meant to protect and improve quality of life issues, environmental sustainability, and protect and improve our water quality for the people of this county and for our future generations.

Chris Pehoski

Chris Pehoski
6675 Highway 10 East
Stevens Point, WI 54481

Town of Stockton Supervisor,
Former member of GCAC,
Organic, biodynamic, and sustainable farmer for over 23 years, located in Wellhead Protection Area "C" of the Stevens Point Recharge Area

To: Ray Schmidt, Portage County Planning and Zoning Department

From: Sharon Schwab, Portage County citizen (Town of Grant)

Date: February 13, 2004

Re: Draft Groundwater Management Plan

Congratulations on the Groundwater Management Plan, and thank you for the opportunity to review its contents. Most of my comments include simple typographical errors, acronyms, etc. My biggest criticism is that when studies are cited in the plan's content (and there are many), they are not properly acknowledged. Please add a literature cited section which gives credit where due. Thank you for your consideration, and best of luck on these revisions. I hope the County will embrace its contents and commit to long-term groundwater management and protection.

Section1.1. Para 3 delete "and herbicides" (pesticides includes herbicides)
Section 1.2 Obj 4 "federal, State" – be consistent w/capitalization?
Section 3.2, Table 3.3 Surely we've gotten beyond calling wetlands "swamp and waste" Can't this be updated? In the paragraphs below there is no description of so-called swamp and waste, like there are for all the other land use categories.
Pg 25, 2nd Para 2 – capitalize "village"?
Table 3.4 – 3.5 – I have figures that say the Town of Grant population was 2020 in the 2000 Census, yet your numbers are far less than that? Are the municipality numbers and pop trends from the final 2000 census?
Section 3.5 – you mix WDNR and DNR throughout. Be consistent w/ your acronyms.
Section 3.8 Para 2, DILHR is long gone – USTS are overseen by DOC, please correct.
Section 3.9 Para 1 ...."the soil can do a pretty effective job..." Delete word pretty – sounds like you're editorializing.
Section 3.13.Para 1 & 2 mixing DNR and WDNR again... Also, need a comma w/ "30000 served by POWTS"
Section 3.15. Space needed b/tween Para 1 & 2.
Section 4.2 Para 1 ...."except by a few very knowledgeable individuals" – delete (ouch)!
Pesticides, pg 52 repeat of page 40.
Nitrate Nitrogen Para 2 "UWSP Environmental Task force Lab" – capitalize "Force"
Section 5.1 Para 2 need to insert DOC acronym behind Department of Commerce
In general this entire section was very difficult to read. You bold the department names, but then it's difficult to differentiate the department section names, programs, etc. Is there a better way to offset each department, department section, and program so that it's more readable? That would really help because this section should serve as an important reference to the reader.
Pg 62 – need space between paragraphs on UIC program and High Capacity wells. Also, offset BWM section
Pg 66 Groundwater Sampling Surveys – move sentence up (see other paragraphs) Monitoring Reuse of Atrazine... - combine para 1 & 2.
Department of Commerce , pg 67 Separate para 1 & 2.
Groundwater Research Activities. Pg 71 Effects of land use paragraph (needs period at end). Crandon Mine – delete word "massive" – you're editorializing again.
Pg 75, Para 2 needs a period.
Figure 5.2 Groundwater Protection Area lines are too thick and chunky looking – can this be redone?
WHPO, pg 78 para 1 ...."for a couple of gas stations" – do you mean the number 2? If so, use the number.
5.2.2 Local Government Regulation, pg 80 combine para 1 & 2.
PIE, pg 81, include section about the groundwater literature that was donated to area libraries?
Pg 85 too many spaces b/tween para on Implement County Groundwater .... and Wellhead Protection Ordinances.
Determine Areas w/High Nitrate and Pesticide Levels, pag 86. Combine para 2 & 3.
Support Statewide Pesticide Reporting Database, pg 88 Written 2xs – delete one. Why don't you suggest that that Portage County become a pilot county for this program?
Appx AD – delete spaces after "Grant Recipient"
AD-6 indent 2) Describe the work conducted in this project.

Portage County Planning and Zoning Dept.
Courthouse Annex
1462 Strongs Avenue
Stevens Point WI 54481

The following comments are related to the recent Groundwater management plan.

Overall I found the report to be very good with some excellent recommendations. The following are some areas where I feel some improvements could be made.

I feel the report would be more useful to present and future efforts if a complete inventory of past reports dealing with resource inventory and research related to groundwater in portage county were part of the report or in an appendix. There have been a number of studies conducted by a number of agencies and university researchers that should be used in developing and implementing managing strategies.

Comments relative to the Recommendation Section 6
Page 82. Under pesticide goals number 1 should include (and their breakdown products) at the end.

2. c. This statement needs refinement and clarification. Possible wording would include the sum of all pesticide residues of a known toxicity type should be summed and not exceed the most stringent standard for this group. As worded a pesticide with relative low probable toxicity such as stomach ailment would be compared to a known carcinogen with a much more stringent standard and risk assessment.

Under strategies on pages 83 and 85 I feel there is a need for some formal coordination between the onsite wastewater efforts and the private well efforts to make sure new residences do not place wells down gradient of onsite wastewater systems. There is no wording to suggest current programs are dealing this with.

On page 86 under Healthy People Portage County. I would hope the paragraph would end with unknown or unsafe water quality.

Page 86 under determining areas with high nitrate and pesticide level. The past plan and discussions back to 1980 had as goal of combining data bases between at least the county and UW. This has apparently not yet been done and no date is proposed for completing this task. A statement outlining how this will be accomplished and by when is needed in the plan.

The last section on page 89 refers to land purchases as being much more expensive than annual payments for conservation easements This may not be true if you consider the long term cost of annual payments that will be needed.

I did not see any mention of proposing sewer extensions into unsewered areas to minimize groundwater impacts from onsite waste systems in municipal recharge areas. This may be a viable way on reducing some impacts to groundwater.

I only received a copy of the plan yesterday and have not reviewed the entire plan in detail but wanted to get these comments in before your deadline.

Sincerely

Byron Shaw
Emeritus Prof. Water Resources.

February 9, 2004

Ray Schmidt
Planning and Zoning
1516 Church Street
Stevens Point, WI 54481

Dear Ray,

This letter is to express concern for the quality of groundwater. Currently I am renting a home in the town of Stockton and also own a house in the town of New Hope. Both wells are high in nitrates and pesticides, which include atrazine and chloroacitanalides.

It is a sad and scary situation, I am asking that you please pass the "Portage County Groundwater Management Plan" to help identify and resolve these problems in order to protect our groundwater. I would also like to see the County strongly encourage organic farming. Once your plan is passed someone will be needed to work with the farmers and homeowners in order to educate and advice on keeping our waters safe.

Not only is contaminated water unsafe to drink, it is expensive to treat and inconvenient to buy. As a single person I use, approximately, 6 gallons of water a week for drinking and cooking. Copps food store sells 5 gallon containers which you initially pay $13 for, then $2 for refills, you also need to go somewhere to purchase a dispenser–plain water crock. I bought mine at Mahers for $80. Most elderly or handicapped people are unable to lift these large 5 gallon containers so they purchase water by the gallon container-which is also inconvenient to haul. Gallon containers are .70 each. .70 x 6 x 52 = $218/per year/per person. Hauling water from the stores is not only very inconvenient but also need to be done every week. Having water delivered to ones home is even more expensive $6 per gallon.

I would also like to mention that not all people are even aware their water is unsafe to drink. For instance the water where I am living now is high in nitrates at 22 mg/L. I asked the family across the street if they knew what the nitrate levels in their water were, they said no. So they had it tested: results came back at 21 mg/L. Did I mention they have 2 young children.

Homeowners and farmers need to be educated on how to keep the groundwater safe by using the appropriate application of pesticides. These applications should not only be applied using package instructions, but by using results of current soil and water testing. If these steps are not done then strict action should be taken against theses individuals.

We need to have health standard limits set for all pesticides, and if there are none then these unknowns should automatically be set a zero.

Thank you.

Debra Sisk

PCHHS
Portage County Health & Human Services

UDY A. BABLITCH, DIRECTOR
715) 345-5350 FAX (715) 345-5966
-MAIL: pchhsd@co.portage.wi.us

RUTH GILFRY HUMAN RESOURCES CENTER
817 WHITING AVENUE
STEVENS POINT, WI 54481-5292

RECEIVED
APR 21 2003
PORTAGE COUNTY
Planning and Zoning Department

April 18, 2003

Portage County Planning and Zoning Committee
c/o Planning and Zoning Department
1462 Strongs Avenue
Stevens Point, WI 54481

Gentlemen:

As the Health Officer for Portage County, I wholeheartedly support the adoption of the proposed Groundwater Management Plan Revisions by your committee. This plan represents a comprehensive and responsible approach to drinking water quality for all residents of Portage County.

EPA Administrator Christie Todd Whitman has described water as "the biggest environmental issue we face in the 21st century in terms of both quantity and quality." An adequate supply of clean drinking water is vital to the public health of our county as well as its economic stability. Please join me in supporting this important effort to protect the health of our citizens. Thank you.

Sincerely,

Faye Tetzloff

Faye Tetzloff, R.N., MSN
Health Officer

PLNZONE.JUN

Where Government Serves the Community

February 11, 2004

Ray Schmidt
Portage County Planning and Zoning
Stevens Point, WI 54481

Dear Mr. Schmidt,

I am a Water Quality Specialist at the University, the GCAC representative for the Town of Lanark, but am writing you as a citizen of Portage County. I would like to thank you for putting the Groundwater Management Plan revision together. I support the passage of the Plan, but would like to suggest some revisions and make some comments regarding comments that were made at last evening's Public Hearing.

First and foremost I would like to comment on the cost that contaminated water has on our community at what appears to me as unfair burden of the cost on those not necessarily responsible for the contamination. I would like to see an Economic assessment of the costs to the citizens and businesses in the county for treatment, lost business, etc. due to contaminated groundwater. This should be conducted by a third party and could also include the cost due to health issues. This level of contamination is not common nationwide and I've no doubt there are grant programs that would help pay for the cost of this assessment. Following the assessment, I believe a program to help homeowners/businesses with the costs incurred in the treatment of their drinking water until we get this groundwater problem under control (perhaps an additional tax on fertilizer and pesticides purchased for home or agricultural use). As your survey suggests, only a small percent of those with contaminated drinking water treat it. Some of these folks cannot afford to have treatment systems installed or buy bottled water. Given the abundance of groundwater in the county, I really think it is a shame that anyone in Portage County should be required to buy bottled water.

Second, there was comment at the Public information meeting on Feb 3 and the Public Hearing on Feb 4 about Section 6.13 1. The citizen felt that all wells deplete the county lakes, streams, and groundwater, and therefore, he thought the statement was unnecessary. I disagree. A normal household well may reduce some of the groundwater, but by no means depletes it.

Some discussion at the meetings was related to organic and sustainable agriculture. Traditionally our agencies have supported (staff and programs) conventional agriculture, but have for the most part left folks interested in organic and sustainable agriculture to fend for themselves. Many of these practices have significantly lower inputs of nutrients and less or no leachable pesticides. One example is rotational grazing. I have been studying the impacts to groundwater from management intensive grazing in central Wisconsin (one farm was the Paul and Pat Onan farm in Amherst Junction) over the last

5 years. Though there are some nitrates in groundwater below these paddocks, it is significantly less than what I have measured below other systems. In addition, most of these farmers do not use pesticides. I am not suggesting forcing all farmers to change to these systems, but I am suggesting that the county programs support and promote these programs to interested farmers.

Respectfully,

Nancy Turyk
6813 Madley Rd
Amherst, WI 54406