



**Background, Main Findings, and
Recommendations Report for the Protection of
Surface and Groundwater Quality in St. Croix
County**

**Presented to the St. Croix County Board of Supervisors for their
consideration**

St. Croix County Surface and Groundwater Quality Protection
Study Group

October 4, 2017

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Table of Acronyms

ATCP	Agriculture, Trade and Consumer Protection
BOD	Biological Oxygen Demand
CAFO	Confined Animal Feeding Operation
CDD	Community Development Department
CREP	Conservation Reserve Enhancement Program
CST	Certified Soil Tester
DATCP	Department of Agriculture, Trade and Consumer Protection
DNR	Department of Natural Resources
DSPS	Department of Safety and Professional Services
EQIP	Environmental Quality Incentives Program
HHS	Health and Human Services
NMP	Nutrient Management Plan
NRCS	National Resource Conservation Service
POWTS	Private Onsite Waste Treatment Systems
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UW	University of Wisconsin
WCWRPC	West Central Wisconsin Regional Planning Commission
WGNHS	Wisconsin Geological and Natural History Survey

Summary of Groundwater Study Group Process and Recommendations

GROUP PROCESS

On December 6, 2016, the County Board of Supervisors conducted a Public Hearing on a “Moratorium Ordinance on the Establishment or Expansion of Large Livestock Facilities”. A motion was passed (Yes - 15; No - 4) to amend the original resolution on the moratorium to instead create a “Special Study Group to Address Nutrient Pollution-Large Livestock Facilities”. The first meeting of the study group occurred on January 10, 2017 and met twice monthly after that until September 26, 2017.

The group adopted the following over-arching goal to guide its work, especially its effort to identify priority recommendations.

Over-arching goal

To provide the St. Croix County Board with sound science-based recommendations for policies that protect the quality of groundwater supply that our County residents rely upon for personal household use and consumption.

The study group meetings were organized around two general activities: educational presentations and facilitated discussions. The education presentations included topics on:

- Groundwater hydrology and related issues;
- Community Development Department’s capabilities and practices;
- Groundwater modeling;
- Agriculture and nutrient management;
- Legal aspects of livestock siting and operations regulation;
- The roles of the Department of Natural Resources and the Department of Agriculture, Trade, and Consumer Protection; and,
- The recent experience with groundwater quality protection in Kewaunee County.

The facilitated discussions were designed for group members to discuss the issues, the main findings from the presentations, and to work toward identification of the eventual recommendations. Ultimately, the group narrowed the list of recommendations to a core set of eight recommendations for the County Board’s action.

CORE RECOMMENDATIONS

The eight core recommendations identified by the Study Group are (in no particular order):

- Explore options regarding the regulation of livestock operations and licensing for facility siting for ongoing monitoring of livestock operations for the purpose of protecting water resources.
- Increase the number of acres in nutrient management plans (NMPs).

- Revise the County’s land use policy and zoning ordinances to protect groundwater resources by:
 - Exploring options for adopting each of five levels of authority for regulating well design and construction, as specified in NR 845.05;
 - Exploring options to update well construction standards, including casing, depth, grouting and well casing down to water source, as well as improving data quality;
 - Separating incompatible land uses;
 - Varying lot size requirements in environmentally sensitive areas;
 - Establishing groundwater recharge zones; and,
 - Encouraging common POWTS and shared wells constructed to a higher standard.

- Develop a county protocol for urgent response to actual or potential water resource pollution events that threaten human health, the environment, or natural resources.

- Develop a scientifically sound drinking water well testing program to create baseline data to measure drinking water quality over time, including:
 - Consistent recording of pertinent data;
 - Maintaining and improving the county database of all well construction records and water test information; and,
 - Increasing participation in the existing drinking water well testing program

- Identify and map environmentally sensitive areas and conduits to groundwater to improve siting of POWTS, wells, spreading, etc. Map closed depressions, sinkholes, and karst. Develop, update, improve, or publish data and maps for depth to bedrock, recharge, discharge, aquifers, etc., and provide information to the state for implementation in the SnapPlus program. Map areas with high vulnerability to agricultural and a variety of pollutants.

- Develop a plan with cost estimates for constructing another inset model for areas of interest and concern. Conduct research to determine the source of nitrate issues, distinguishing between non-agricultural or agricultural.

- Establish active water quality committee to ensure that the protection of ground and surface water continues to be a priority issue actively addressed by the County.

Introduction

On December 6, 2016, the County Board of Supervisors conducted a Public Hearing on a “Moratorium Ordinance on the Establishment or Expansion of Large Livestock Facilities”. A motion was made, seconded, and passed (Yes - 15; No - 4) to Amend the Original Resolution on the moratorium to instead create a “Special Study Group to Address Nutrient Pollution-Large Livestock Facilities.” In response, the St. Croix County Surface and Groundwater Study Group was created by County Board resolution to “address nutrient pollution of St. Croix County’s water resources from large Livestock Facilities and other sources” (Resolution No. 55 (2016)).

The membership of the group was established on January 3rd, 2017 and met for the first time on January 10th, 2017. There are 9 members, including 3 County Board Supervisors and 6 citizen members. The group decided to address pollution of water resources in general and adopted the following overarching goal:

To provide the St. Croix County Board with sound, science-based recommendations for policies that protect the quality of the water supply that our County residents rely upon for personal household use and consumption.

The meetings initially focused on establishing the goal, scope and procedural items. Subsequent meetings explored various topics related to pollution of groundwater, roles and capabilities of various agencies, and approaches to the development of recommendations. The meeting schedule and topic list is presented at the end of this section.

The scope of the Study Group included:

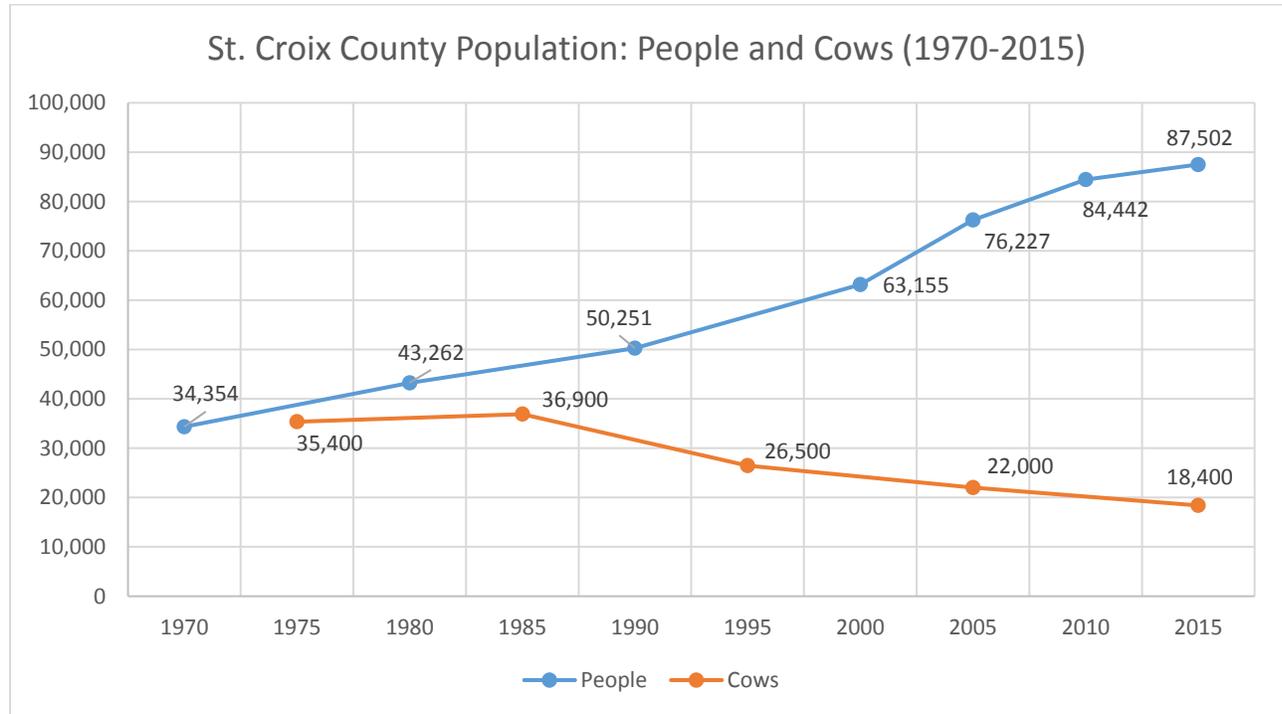
1. A summary table description of authorities related to surface and groundwater protection for Federal, State, County, and other administrative units.
2. A report on key findings that identifies effectiveness of existing St. Croix County activities, plans, policies, programs, and regulations in protecting ground and surface water quality relative to established standards.
3. Recommendations for the County Board regarding options to protect groundwater and surface water quality from pollution for the health, welfare, and safety of our residents, businesses, and environment.

This report addresses items 1, 2, and 3 as outlined in the description of the scope above. The report is organized as follows. Part 1 addresses the groundwater situation in St. Croix County. Part 2 addresses regulation and management of surface and ground water. Part 3 addresses the capabilities and programs of the St. Croix County Government in protecting ground and surface water quality. Part 4 addresses private onsite wastewater treatment systems (POWTS). Part 5 addresses wells. Part 6 addresses nutrient management plans. Part 7 addresses livestock siting and operations. Part 8 addresses data, tools, and studies related to the management and protection of groundwater. Report concludes with a presentation of the study group’s eight core recommendations.

Date	Meeting Topic
1/10/2017	Study Group Logistics and Schedule
1/17/2017	Goal and Scope of Study Group
2/14/2017	Presentation and discussion on factors affecting groundwater quality -- Kevin Masarik, UW- Extension Review of Community Development Department's Capabilities and Practices Related to Groundwater Quality --Ryan Yarrington
2/28/2017	Review of Community Development Department's capabilities and practices related to groundwater quality -- Tammy Wittmer
3/14/2017	St. Croix County Groundwater Flow System - Future Investigations, Paul Juckem, Hydrologist, USGS Wisconsin Water Science Center
3/28/2017	County Ordinances Pertaining to Agriculture and Nutrient Management Summary - Steve Olson, CDD and Ryan Sterry, UW Extension
4/11/2017	Discussion on Possible Framework for Assessing Information to Formulate Recommendations for the County Board , Example from Dunn County - Chris Straight, WCW RPC
4/25/2017	Key findings and recommendations based upon past meetings
5/9/2017	Key findings and recommendations based upon past meetings
5/23/2017	Discussion on Process and Experience with Study Groups - Pat Malone, UW Extension Livestock Siting and Operations Regulations - Scott Cox
6/13/2017	Proposed Amendments to ATCP 51 Administrative Rule regarding Livestock Facility Siting Setting goals for identified issues towards identifying recommendations
6/27/2017	Role of WDNR in protecting groundwater quality - Russel Rasmussen, DNR Role of DATCP in protecting groundwater quality - Sara Walling, DATCP
7/11/2017	Facilitated discussion to develop recommendations for protection of groundwater quality in St. Croix County
7/25/2017	Facilitated discussion to develop recommendations for protection of groundwater quality in St. Croix County
8/8/2017	Facilitated discussion to develop recommendations for protection of groundwater quality in St. Croix County
8/22/2017	Presentation on Experience with Groundwater Quality Protection in Kewaunee County – Lee Luft Facilitated discussion to develop recommendations for protection of groundwater quality in St. Croix County
9/12/2017	Facilitated discussion to develop recommendations for protection of groundwater quality in St. Croix County
9/26/2017	Facilitated discussion and revision of draft final report on Background, Main Findings, and Recommendation Vote on accepting draft final recommendation report

Part 1 The groundwater situation in St. Croix County

St. Croix County is one of the fastest growing counties in Wisconsin. In 2016, it had an estimated population of 88,029 people (up 4.3% since 2010) and 18,400 cows. The trend is for a declining population of cows and an increasing population of people, as shown in the figure below. In 2016, there were 35,224 housing units in the County, up 3.7% since 2010, while the number of dairy farms has declined from 934 in 1975 to 159 in 2015 (USDA). The County-based economy is driven by manufacturing, government, healthcare, and agriculture. However, according to the US Census Bureau, nearly 67% of St. Croix residents travel outside the County for their employment.



Source: U.S. Census Bureau and US Department of Agriculture

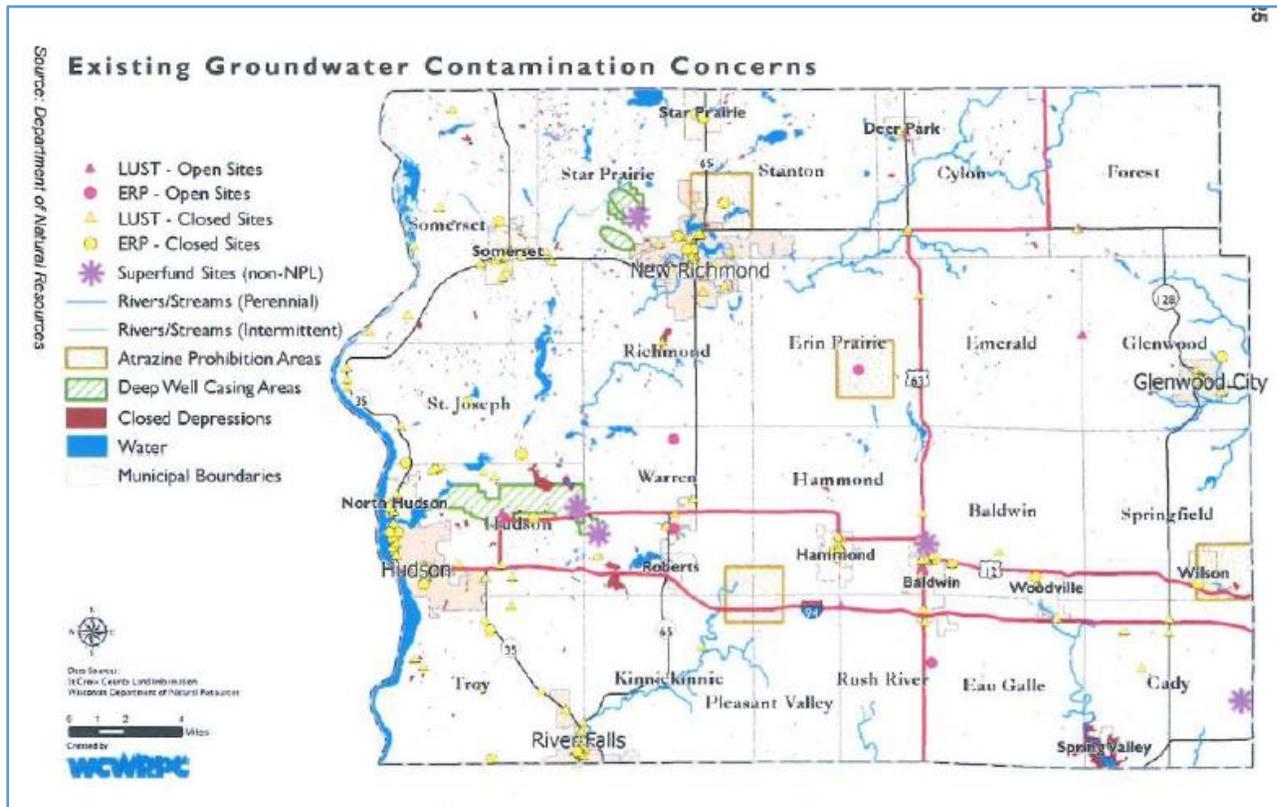
In St. Croix County, groundwater is the sole source of residential water supply. St. Croix County's groundwater and surface water are interconnected with 57-91% of annual streamflow generated from groundwater. Likewise, 82% of groundwater in the County is from in-county recharge and 15% from rivers. Only 4% of St. Croix's groundwater is sourced from outside the county boundaries. The groundwater budget for St. Croix County is presented in the table below:

St. Croix County Groundwater Budget

	Groundwater In	Groundwater Out
Recharge	82%	0%
Rivers	15%	85%
Wells	0%	1%
County Boundaries	4%	14%

Source: Paul Juckem

The most prevalent problem with groundwater quality in the County relates mainly to nitrates. Current groundwater contamination concerns are shown in the map below.



Of particular concern for controlling groundwater contamination is the need to know, understand and manage risk associated with major conduits from the surface to the groundwater source. The conduits are primarily from wells, sinkholes, closed depressions, and fractures in the karst areas.

St. Croix County has significant areas of karst features, but mapping of individual features has not yet been undertaken. Sinkholes are of particular concern, which require in field discovery and/or verification. It is possible that the County can use its high accuracy elevation data and aerial photography to identify sinkholes. Potential sinkholes would likely still require field identification to confirm. One possibility to facilitate this process is for the County to include a requirement for the identification and notification of sinkholes with cost-sharing programs. This might be allowed in NR 151 or ATCP 50, but would need to be investigated further. Beyond location and mapping of surface karst features a better understanding of local groundwater flow in underground karst aquifers in the County is needed.

The Wisconsin Geological and Natural History Survey (WGNHS) undertook a study in 2004 - 2005 to better understand the hydrogeologic model for West-central Wisconsin including St. Croix County. The study recognized the occurrence and function of karst as the foremost data needed for better understanding how groundwater flows in the West-central Wisconsin region. This study and further studies of karst and bedrock fractures can better inform the USGS Groundwater Flow Model described

in the next paragraph. The WGNHS study can be found here:
http://wri.wisc.edu/Downloads/Projects/Final_WR04R006.pdf

USGS Groundwater Flow Model

In 2009 the US Geological Survey (USGS) published a regional three-dimensional groundwater-flow model and three associated demonstration inset models. The models were developed to simulate the groundwater-flow systems in the three-county area that includes St. Croix, Polk and Pierce counties. The models were developed by the U.S. Geological Survey in cooperation with the three county governments. The objectives of the regional model of Pierce, Polk, and St. Croix Counties were to improve understanding of the groundwater flow system and to develop a tool suitable for evaluating the effects of potential water-management programs.

The model is built upon the following rules:

1. Groundwater cannot be created or destroyed
2. Water flows down gradient
3. Numerical equations can represent real world conditions
4. Results only as good as data – Calibrate

The model can be used to answer questions about transport (what kind of source does the water come from?), which will depend on flow directions and pumping rate. It can also be used to address site specific questions (where will the contaminant go and when will it arrive?), which will depend on flow direction, velocity, degree of karst, and the contaminant.

You can access the report at: <https://pubs.er.usgs.gov/publication/sir20095056>

Main Findings

- There are several superfund sites and deep well casing areas in the county with known groundwater contamination.
- A key concern for controlling groundwater contamination is the need to know about and manage major conduits from the surface to the groundwater source. The conduits are primarily from wells, sinkholes, closed depressions, and fractures in the karst areas.
- Little is known about local groundwater flow in karst aquifers within St. Croix County.
- St. Croix has significant areas of karst features, further study and mapping of individual features is needed to better inform groundwater flow models.
- The USGS and WGNHS have completed groundwater and geology studies that should be leveraged to manage groundwater.
- The quality of the modeling answers depends on scale, available data, and tools, required level of precision (safety factor), and type and precision of question.

Part 2: Regulation and management of surface and groundwater

There are several tools available to regulate and manage surface and groundwater to protect water quality. These include the authority to set:

- **Quality standards** – Set standards for maximum contamination levels for specific contaminants for water resources. There are specific quality standards for Drinking Water. These are typically set by the federal government and adopted by the state. Local governments can petition to have additional quality standards added.
- **Performance standards** – Set standards guiding how the quality standards will be achieved. Typically set by state agencies and adopted at the local level.
- **Technical standards** – Set standards for how the performance standards will be achieved. Typically set by a specialized state agency and adopted at the local level. These can be exceeded to protect human health and safety.

Uniform State Standards generally prohibit local governments from adopting regulations that are stricter than state standards. If exceptions are allowed, it is usually under the burden of being reasonable and based on scientifically defensible findings of fact, adopted by the locality as being necessary for protecting human health and safety. Exceptions can also be required to consider economic and technical feasibility.

Additionally, administrative units must have the authority to:

- **Regulate** – Making determinations on activities that are allowed or disallowed. This involves monitoring, inspection, zoning and permitting. Enacting regulations need to be considered within the context of cost, staffing, compliance, and citizen relationships.
- **Enforce** – Having the authority to ensure compliance with regulations through both monitoring for compliance, as well as enforcement for noncompliance. This often relies on monitoring, testing, and inspections.

Additional tools of regulating authorities include:

- **Research, modeling, mapping, and data analysis,**
- **Emergency response and notification,**
- **Education,** and
- **Advocacy.**

Together these tools, and others, help regulatory authorities work toward achieving both the resource management and public interest goals of their mandate.

Main Findings

- The burden to justify an exceedance is high and difficult to uphold.
- The main tools for the county government include zoning, permitting, inspections, and monitoring. Use of these tools should be adopted within the context of available budget and staffing, citizen compliance, and the need to maintain good citizen relationships.

Part 3 Capabilities and programs of the St. Croix County Government for protecting ground and surface water quality

This section looks at capabilities and programs of the St. Croix County Government. In particular, it examines modeling, data collection & analysis, mapping, education and other programs.

The mission of the Community Development Department (CDD) is to “serve the public and guide communities by balancing the use and protection of natural resources with the needs of the public to enhance the quality of life for current and future generations.” The CDD manages and administers four divisions with seven program areas: Planning, Land Information and Geographic Information Services, Real Property Description, Land Use Code Administration and Enforcement, Resource Management, Recycling, and Parks. Although all program areas are interrelated, each program area operates under separate authority or County responsibility. The CDD administers and enforces the St. Croix County Code of Ordinances for Land Use and Development, including for zoning, land division, sanitary, non-metallic mining, and animal waste storage facilities. It is responsible for zoning, permitting, and inspecting a wide variety of uses that can impact water quality.

To accomplish this task, the CDD maintains a large set of tools that include databases, data analysis, modeling, and mapping. It maintains records on externally collected data (primarily from state and federal agencies) that include:

- Well construction
- Well testing, for tests done through county-sponsored well testing programs
- Geologic and hydrologic data
- Water resources data
- LIDAR data
- Topographic data
- Depth to bedrock
- Soil types
- POWTS suitability
- Environmental Corridors

Within its mandate, the County has adopted several policies, ordinances and associated programs to fulfill its responsibilities regarding groundwater quality protection. These include:

Policy Documents include:

- St. Croix County Comprehensive Plan
- The Farmland Preservation Plan
- St. Croix County Natural Resource Management Plan
- St. Croix County Outdoor Recreation Plan
- Bass Lake Watershed Management Plan
- Perch Lake Watershed Management Plan
- Squaw Lake Watershed Management Plan

Groundwater Quality Programs and Policies include:

- County Ordinance Chapter 11 on Animal Waste Storage Facilities and Animal Waste
 - Nutrient Management Planning, education, and annual review
- County Ordinance Chapter 12 on Private On-site Wastewater Treatment Systems (POWTS)
 - Groundwater Quality Programs
- County Ordinance Chapter 14 on Non-metallic Mining
- County Ordinance Chapter 17 on Zoning – Prohibits junk, abandoned vehicles, leaking fluids from automotive and industrial land uses
- Well Abandonment Assistance and Cost-Share Program
- Abandonment of Waste Storage Structures
- County Ordinance Chapter 21 on Municipal Solid Waste – recycling and household, agricultural, and small business hazardous waste
- Hazardous Waste Collection Programs in the spring and fall of each year
- Tire and appliance collections in the spring and fall of each year
- Promote compost bin use through sale and education
- Household well water testing and education focused on 2-3 towns annually
- Take back prescription drug programs

Surface Water Quality Programs include:

- County Ordinance Chapter 17 Zoning
 - Storm water structures: land divisions, shore land, and riverways
 - Erosion control structures and activities: land divisions, shore land, and riverways
 - Farmland Preservation Zoning and required Nutrient Management Planning
- Stream bank restoration
- Annual Transect Survey measuring data on soil loss due to erosion
- Conservation Reserve Enhancement Program (CREP)
- Agricultural Best Management Practices
- Tree, shrub, and native plant sale to decrease erosion and surface water run-off
- Farmland Preservation Program Annual Conservation Compliance Certifications

Educational Activities include:

- Multi-year – Dry Run Creek Producer-Led Initiative & Farmer Led Council Civic Engagement Activities with four neighboring counties & UW-Extension
- Nutrient Management Farmer Education Course
- Ag Producer field demonstrations
- Adult and Student presentations, Earth Day Event, Envirothon participation, stream ecology workshops, field day events, Conservation Speaking & Poster Contests, Raingarden class
- Invasive species workshops & demonstration projects
- Master Gardener Program through UW Extension
- Rural Living Guide through UW Extension

Main Findings

- The CDD currently has a comprehensive set of programs and capabilities addressing surface and ground water contamination in the County
- The County currently has Ordinances enacted that allow for permitting, monitoring and inspection related to surface and ground water contamination.

Part 4 Private Onsite Wastewater Treatment Systems (POWTS)

Homes in Wisconsin that are not connected to municipal sewer service are required to use private onsite wastewater treatment systems (POWTS) to dispose of all domestic wastewater. The goal of disposing domestic wastewater is to reduce the impact of system outputs such as nitrates, phosphorous, pharmaceuticals, and pathogens on the environment.

The Wisconsin Department of Safety and Professional Services (DPS) administers the regulation of POWTS in Wisconsin. Wisconsin Statute 145 provides DPS with the general authority to establish minimum standards to ensure buildings and facilities in the state shall be safe, sanitary and safeguard the public health. Wisconsin Administrative Code Chapters SPS 383-385 contain the uniform standards that cannot be more restrictive at the county level. Chapter SPS 383 establishes uniform standards and criteria for the design, installation, inspection, and the management of POWTS. Chapter SPS 384 governs the quality and installation of materials and equipment relating to plumbing. Chapter SPS 385 establishes minimum requirements for evaluating and reporting soil and site characteristics that may affect the treatment or dispersal of wastewater.

The County is responsible for administering the state code standards under Wisconsin Statute 145.13. St. Croix County has assigned the responsibility to regulate POWTS to the Community Development Department through the St. Croix County, Chapter 12, Sanitary Ordinance. The Community Development is required to review Soil and Site Evaluation reports; approve or disapprove state and county sanitary applications; inspect all POWTS installations before backfilling to ensure compliance with design standards; and to enforce the replacement of failed POWTS. The state recognizes the failure of a POWTS as the backup of domestic wastewater inside a structure and the discharge to groundwater, zones of saturation, drain tile and/or bedrock. State code requires 36 inches of suitable soil separation between the infiltrative service and any limiting factor. A Certified Soil Tester (CST) must complete three borings and describe the soil profile to recommend an infiltration rate for the POWTS sizing and must list any limiting factors. This is known as a Soil and Site Evaluation (FKA 'perc test'). The Soil and Site Evaluation determines the system type (conventional, at-grade, mound). The size of the POWTS is reflective of the number of bedrooms in a residential structure and the infiltration rate determined by the Soil and Site Evaluation.

A State Sanitary Permit is required for the installation of a POWTS. A County Sanitary Permit is required for the repair, reconnection or rejuvenation of a POWTS and for the installation of a non-plumbing sanitation (i.e. privy, composting toilet, etc.). In St. Croix County, a sanitary permit is required prior to obtaining a building permit from the Town. Only a licensed plumber can submit a sanitary permit application for review. Upon approval, the licensed plumber can install the POWTS. St. Croix County will conduct at least one inspection for all work requiring a sanitary permit. In certain circumstances or for certain system types, multiple inspections may be required throughout the POWTS installation.

When applying for a sanitary permit, St. Croix County requires the property owner to submit a signed agreement indicating that the owner will maintain the septic system properly and report maintenance to the Community Development Department. Proper maintenance of a POWTS is essential for system performance and longevity. The State requires maintenance of a POWTS once every three years and requires the system to be pumped and/or inspected. Each county is required to track this maintenance. St. Croix County sends post cards to the property owner when maintenance is required. A licensed

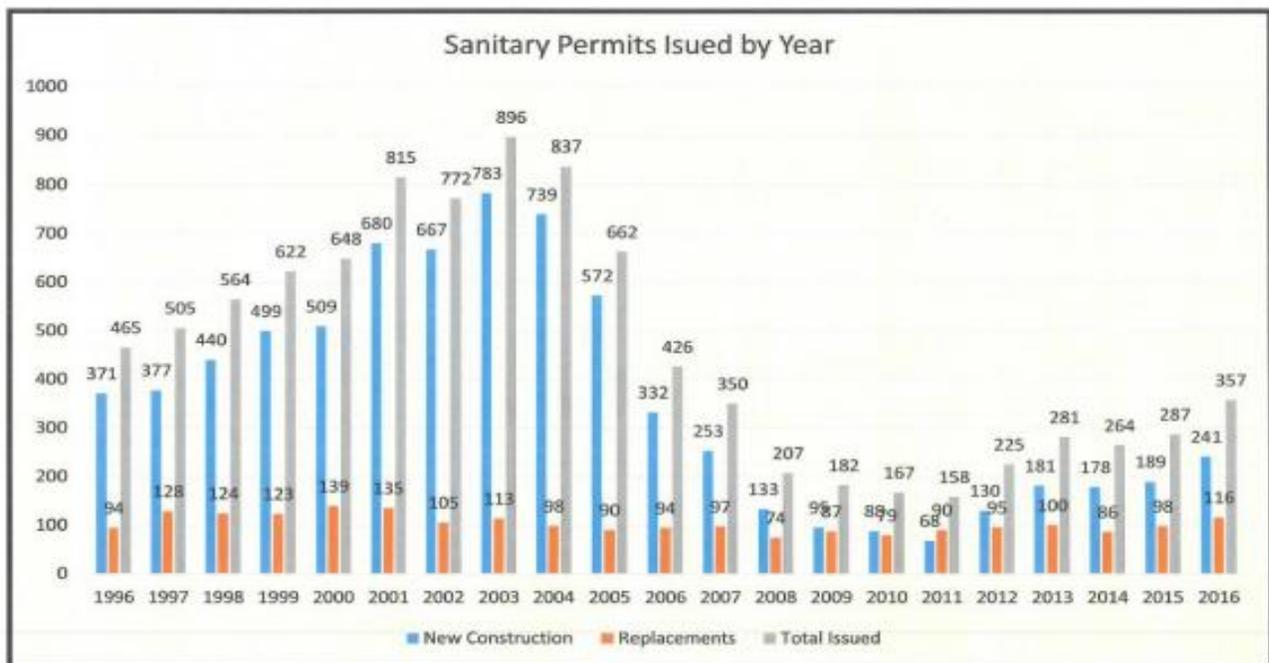
master plumber, POWTS inspector, septage servicing operator or POWTS maintainer must conduct inspections; an unlicensed individual cannot submit maintenance reports to the County.

Currently, the steps taken in the County to ensure that POWTS operate properly to protect to the environment include:

1. Soil and site evaluation for proper system type and sizing;
2. Sanitary permit required prior to obtaining a building permit;
3. Holding tanks are only allowed as a system of last resort, for a replacement;
4. All POWTS are inventoried and receive a three-year maintenance notification; and
5. Time of sale inspections are typically required by mortgage companies or requested by a buyer. Note that counties are not allowed to require time of sale inspections.

There are approximately 15,300 POWTS in St. Croix County.

Total Number of Systems Constructed or Replaced Exceeds 15,300 in St. Croix County



Approximately 2,000 POWTS were installed before state sanitary permits were required. Therefore, permits do not exist for those POWTS. St. Croix County recognizes these systems because the state required an inventory of all existing POWTS in each county. That inventory has been completed. These systems identified through the inventory process are being tracked through a maintenance cycle to be pumped and/or inspected once every three years. If a homeowner wanted to make a significant change to their home and there is not an existing sanitary permit, they would need to have a Soil and Site Evaluation completed. The homeowner may then need to upgrade the system, depending on the results of the Soil and Site Evaluation.

Proper maintenance typically requires waste material, known as “septage” or “sludge,” to be pumped from the septic tank. The Wisconsin Department of Natural Resources (WDNR) regulates the disposal of

septage. Septage can be land spread at preapproved sites or disposed of at a municipal wastewater treatment plant. When sited properly, land application of septage can recycle nutrients, reduce fertilizer needs and improve soil health. Licensed pumpers spread septage directly to farm fields based on application rates determined by the agricultural use of the land and the soil type. Methods for applying include liming prior to land spreading, incorporation of septage into the soil, and subsurface injection. In St. Croix County, soil conditions could allow up to 478,000 acres of septage to be land applied. Currently, only 1,534 acres are permitted. St. Croix County does not regulate land spreading of septage by haulers, as WDNR Conservation Wardens regulate this.

If sited properly POWTS are very effective at removing Biological Oxygen Demand (BODs), Fecal Coliform, phosphorous, and replenishing groundwater.

Removal Rates

Table3-17. Examples of soil infiltration system performance

Parameter	Applied concentration in milligrams per liter	Percent removal	References
BOD ₅	130-150	90-98	Siegrist et al., 1986 U. Wisconsin, 1978
Total nitrogen	45-55	10-40	Reneau 1977 Sikora et al., 1976
Total phosphorus	8-12	85-95	Sikora et al., 1976
Fecal coliforms	NA*	99-99.99	Gerba, 1975

* Fecal coliforms are typically measured in other units, e.g., colony-forming units per 100 milliliters.

Source: Adapted from USEPA, 1992.

USEPA Onsite Wastewater Treatment Systems Manual

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POWTS are not as effective at removing nitrates, typically 10 - 40% of the total nitrogen is removed by a POWTS. Technology is available that can remove more nitrogen. However the exact cost is unknown at this point in time. It is estimated to cost an additional \$6,000-\$12,000 per POWTS. The level of anticipated nitrate reduction will determine the cost. Today, the current cost for a new POWTS ranges from approximately \$6,000-\$20,000. These estimates vary depending on the size of the system due to the Soil and Site Evaluation and the number of bedrooms. At this time, nitrate removal technology is not required by the state for the installation of a POWTS.

Main Findings

- The Wisconsin Department of Safety and Professional Services (DSPS) administers the regulation of POWTS in Wisconsin.
- Wisconsin has uniform statewide design standards and counties cannot be more restrictive.
- Each county is responsible for administering the state code in relation to POWTS.
- A State or County Sanitary Permit is required prior to the installation of a POWTS.
- St. Croix County administers a POWTS maintenance program and sends notifications to property owners when they need to have their POWTS inspected and/or pumped.
- POWTS are very effective at removing phosphorous, fecal coliform and BODs. However, they are not as effective at removing total nitrogen.

- There is additional nitrogen removal technology available for POWTS.
- WDNR oversees the land spreading of septage.

Part 5 Wells

In 2016, there were approximately 161 public wells in the county with 11 municipal water systems supplying water to nearly 42,000 residents. The average municipal well depth is 300 feet. Municipal and other public water systems are regulated by the Wisconsin Department of Natural Resources and test regularly to ensure they meet safe drinking water standards. The rest of the County's population obtains its water from private wells. It is estimated that there are around 16,000 private wells in the County with an average depth between 75-200 feet (based on an estimated 9,859 well construction logs maintained since 1988). Private wells are not required to be tested, nor any corrective action to be taken if contamination is found. Each private well owner holds the responsibility for maintaining and ensuring the safety of their well water.

Wisconsin law requires that a property owner provide advance notice to the DNR before construction of any new private well. Since 1988, a well construction report must be completed and submitted to the DNR within 30 days of well construction. These well construction reports are available to the County. St. Croix County does not regulate well construction. Information on wells constructed prior to 1988 is limited and only viewable as images. Reviewing the scanned well logs is time consuming and less reliable. The CDD will review area well construction reports when considering proposed land use changes.

High capacity wells are regulated by the WI DNR through NR 812. The County has no authority to permit or regulate high capacity wells. DNR well construction reports show that 99 high capacity wells were constructed between 1988 and 2014. There was a 37% increase in the number of high capacity wells in St. Croix County from 2010 to 2014. High capacity well owners report water use data to the DNR. Water withdraw reports are available from the DNR.

Private wells provide water for both drinking water and irrigation. Currently, permitting and submission of well construction reports is managed by the DNR and data is shared with the County. NR 845 allows for county adoption and enforcement of an ordinance for private well location, well construction, well abandonment or pump installation and for department review of county delegation programs. NR 845.05 designates five levels of private well regulation available to counties. These are:

- Level 1: Private well location;
- Level 2: Well location and pump installation permits;
- Level 3: Inspections of private water systems;
- Level 4: Private well construction; and
- Level 5: Well and drill hole abandonment.

A county can receive authorization to administer all five levels of regulatory authority. The DNR would require that the county have qualified employees to carry out the duties for each level. The County would need to have sufficient people (i.e. certified inspectors) to inspect and legal counsel willing to enforce. Benefits of county administration of private well regulations include better access to data, better information on where wells should go, better information on abandonment, and access to the initial well driller water test results. These benefits would come with additional staffing and cost considerations.

Well constructors are required to collect water samples for bacteriological and nitrate testing and to submit the sample to a certified laboratory and provide the results to the owner and the DNR. Any time

a well pump installer or driller touches a well, new water testing is done and results are provided to the owner. It is critical that proper sampling methods be used as data integrity is required to make good policy decisions. The cost of private well water testing is the responsibility of the private well owner.

St. Croix County and UW-Extension have a long history of private well water testing for drinking water quality dating back to 1999. The current Drinking Water Testing Program is designed to offer voluntary testing to two-four towns each year with the goal of offering testing to each town every five years. The program offers a groundwater and drinking water education session and an easy format for residents to test their drinking water. The programs can offer reduced testing fees due to volume discounts offered by testing labs. The programs are voluntary. The County conducts targeted publicity campaigns to encourage well owners to have their water tested. The County normally contracts with the UW-Steven Point lab to ensure test results are available to the County for analysis.

The County sells test kits on an individual basis, but doesn't necessarily receive the test results depending upon which lab a well owner chooses. Private labs protect the privacy of test results for water samples it has received. Well owners always have to option to share their results with the county regardless of which lab a test is sent to.

The DNR has specified a few deep well casing areas that are required to use deeper wells which are cased to the water source to avoid known contamination. This is required unless they get a variance from the DNR. It might be possible for the County to include requirements for well construction based on vulnerable areas or potential land use impacts.

The County Protocol for significantly increased contamination levels is:

1. CDD would look at well test data collected over the years;
2. CDD would review well construction reports;
3. CDD would notify WDNR drinking water staff;
4. HHS will give warnings not to drink and may offer free water testing;
5. CDD would provide additional water testing options to the well owner(s);

Main Findings

- The County has no permitting or regulatory authority over high capacity wells.
- There is no requirement that private wells be tested, nor that any corrective action be taken if contamination is found. Well owners hold complete responsibility for maintaining the safety of their well water.
- Counties can adopt and enforce a DNR authorized ordinance for private well location, well construction, well abandonment, and/or pump installation.
- St. Croix County has a long history of supporting private well water testing through its Drinking Water Program and has had an excellent participation rate
- Citizens can volunteer to share well testing results regardless of which lab the water sample is sent to.
- It might be possible for the County to include requirements for well construction on environmentally sensitive lands.
- The County collects and maintains a database of well construction reports and water tests for private wells.

- Available data might be able to show variability in water quality across time and space, but it hasn't been assessed yet.
- Old wells that are not properly abandoned or new wells with insufficient casing can be contributors to groundwater pollution.

Part 6 Nutrient management plans

Nutrient Management Plans

A farm Nutrient Management Plan (NMP) is a strategy for obtaining the maximum return from on and off-farm fertilizer resources in a manner that protects the quality of nearby water resources.¹ Nutrient management allows farmers to apply the right source of nutrients at the right time, rate and place to meet crop needs and minimize nutrient losses from fields. Nutrient management plans account for all activities on the farm that could affect nutrient needs and losses during one crop rotation. It also accounts for soil type, slope, crop rotations and residual nutrients, and includes both manure and commercial fertilizers. It requires:

- Soil testing
- Record keeping
- Annual crop management according to University of Wisconsin recommendations
- Meeting state and federal standards

The USDA Natural Resource Conservation Service (NRCS) 590 standard is the adopted federal standard that guides nutrient management planning. The NRCS 590 standard has been adopted by the State, and the County adopted this standard by ordinance. At the State level, nutrient management standards follow ATCP 50.04(3) and NR 151. The relationship of the NR 151 and the ATCP 50 rules is as follows:

NR 151	ATCP 50
Sets the Performance Standard	Sets the Technical Standards to meet the Performance Standard
Example: NR 151.03: Soil erosion rates shall not exceed tolerable levels	ATCP 50.04(2) Note: Use NRCS Revised Universal Soil Loss Equations Version 2 (RUSLE2) to calculate the modeled soil erosion rate based on all crop management activities.
NR 151 Nutrient Management Standard	ATCP 50 Nutrient Management Technical Standard
<ul style="list-style-type: none"> • Manure, commercial fertilizer and other nutrients shall be applied according to a NMP • The NMP shall limit or reduce the discharge of nutrients to waters of the state for the purpose of complying with groundwater standards 	<ul style="list-style-type: none"> • Follow ATCP 50.04(3) and NRCS 590 Std • Include all fields and pastures • Written by a qualified planner • Take soil tests • Use DATCP certified lab • Follow UW Fertilizer Recs A2809 • Include all sources of nutrients • Setbacks for manure and fertilizer from sensitive features.

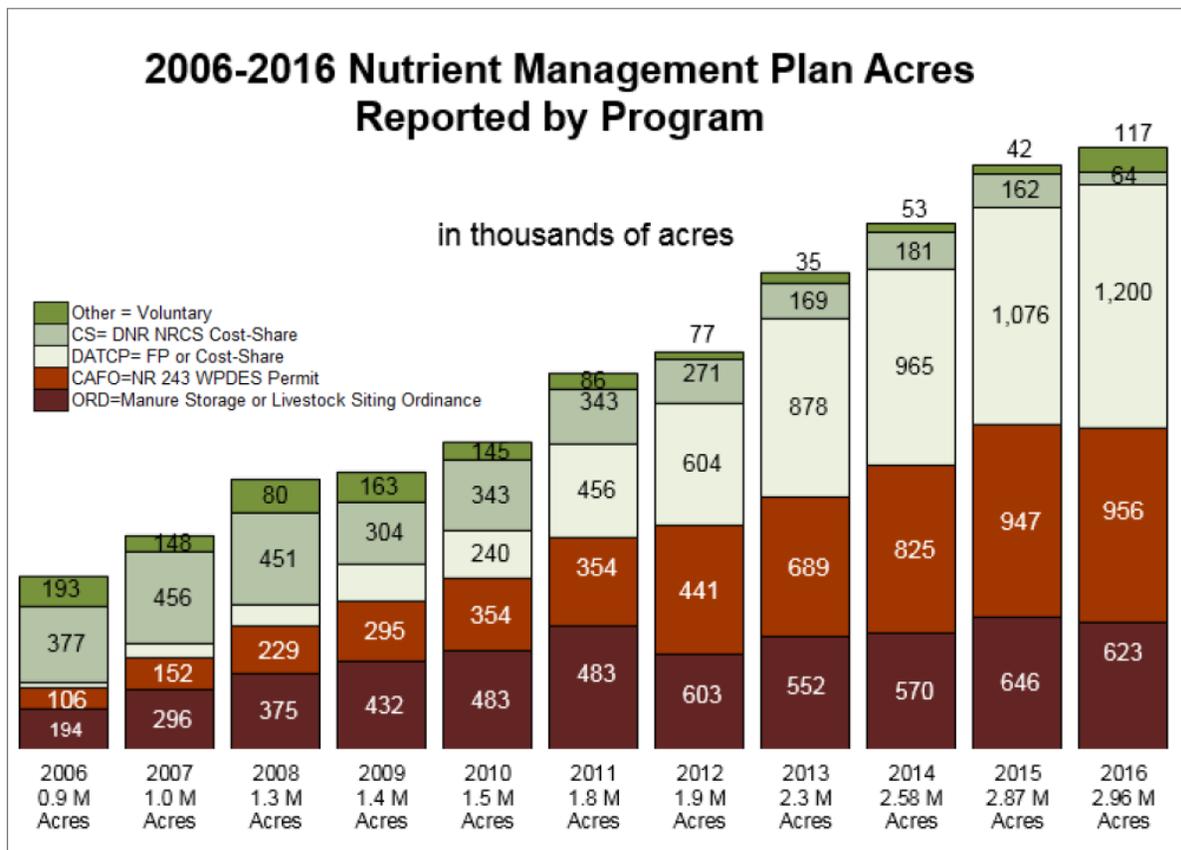
The Community Development Department's Resource Management Division works with farmers to implement nutrient management plans and complete annual compliance checks. A farm reports to the County through NMPs and annual compliance checklists. DATCP is given its authority through Wisconsin

¹ The Natural Resources Conservation Service's Conservation Practice Standard for Nutrient Management, Code 590, states a specific purpose of nutrient management is "[t]o minimize agricultural nonpoint source pollution of surface and groundwater resources."

Statute 281.16(3) which specifies the technical standards to implement the DNR's performance standards. DATCP has conservation practices and technical standards covering animal waste, nutrients applied to soil, and cropland sediment delivery. On a farm-by-farm basis, DATCP evaluates whether an operation has access to a proportional amount of land to distribute the animal unit produced nutrients.

There are about 20,000 dairy cows in the County. About 12,000 animal units are permitted for seven CAFO operations in the County. St. Croix County currently has ~43,000 acres under nutrient management plans. According to DATCP, the percentage of agricultural land with a NMP is 23%, although this number will likely rise to 30% when new data is considered this year. The County doesn't regulate and reporting is not required for farms under 500 animal units and provided the farm is not participating in the Farmland Preservation Program to receive annual income tax credits. Farms that exceed one animal unit per acre of land suitable for waste utilization or operations that exceed 500 animal units or have animal waste storage facilities are required to have an NMP. While there are NMPs for land in cash crops, they are not required unless the land is in Farmland Preservation Program or receiving nutrients from a CAFO.

DATCP and the County cannot enforce that requirement unless they provide 70% cost-share for initial plan development, unless the operation is applying for a permit that requires an NMP. The State pays 70% and the farmer pays 30%. The State spent \$1.7 million statewide (\$7/acre/year for 4 years) to increase the number of acres under NMP's. DATCP relies heavily on county land use staff to implement nutrient management planning.



The County reviews NMPs and will give notice of non-compliance. The County is critical to enforcement. However, for compliance, DATCP has aimed to support programs with education. It is believed that it is more effective to improve working relationships between farmers and the County rather than use a heavy handed approach.

The DNR conducts audits to ensure that best practices are realized on the field. The DNR has stepped up audits. The DNR can train County staff to do audits. The DNR has almost no authority on smaller farms unless the operation has a discharge to surface water. Anyone with a cost-share contract can be required to develop an NMP regardless of farm size.

NMPs primarily look at nitrogen and phosphorus. It must be noted that because nitrogen moves freely, while phosphorous binds tightly to the soil, it is not always easy to test for nitrogen conditions. Currently, NMPs require a soil test every four years from a certified lab with a minimum of one sample per five acres. The nutrient recommendations for nitrogen are based on the crop grown, crop need, and N credits (from spreading, soil conditions, etc.). A soil test is a baseline starting point for developing recommendations.

Process:

1. Measure soil fertility
2. Determine crop nutrient needs (UW Fertilizer recommendations A2809 – maximum – more of an economic optimum)
3. Account for on farm nutrient resources
4. Adjust commercial fertilizer application rates

SnapPlus is a free program developed by multiple agencies. Snap maps show field boundaries, waste spreading restrictions, water quality management areas, well locations, and setbacks. These maps are utilized by producers to guide field applications.

To support the NMP program, there are Nutrient Management Farmer Education Grants, tier 1 and tier 2, which teach farmers to write their own plans. The rationale is that farmers will understand and adhere with the plans better if they write them.

Animal Waste Storage Facilities

Abandoned waste storage facilities are a potential threat to the County's surface and groundwater. Proper abandonment of these facilities protects the public health, environment, safety and general welfare of County residents, animals and plants, and the economy.

Abandoning existing animal waste storage facilities is a challenge for the County due to obtaining land owner participation and securing adequate funding. The abandonment process follows the NRCS Conservation Practice Standard 360. All waste removed is applied according to NRCS Conservation Practice Standard 590 and agronomic rates. Some pre-1985 facilities may not have liners.

Animal Waste Storage is regulated by St. Croix County Code of Ordinances Chapter 11. Chapter 11 also gives the County authority to require abandonment of waste storage structures. Usually property owners want to cooperate, but some do not want to, either with cost-share or without. The current enforcement process relies almost entirely on education about proper practices. The County currently has ten facilities that are no longer in use and need to be properly abandoned. Three of those are under

contract to be abandoned. To assist with waste storage abandonment, there are multiple sources of cost-sharing. However, Wisconsin DATCP funds have been reduced and at this time most funds come from the Federal Environmental Quality Incentives Program (EQIP) cost-share program.

St. Croix County Animal Waste Storage Structures



Proposed NRCS 590 revisions regarding winter manure spreading, increased groundwater protections, and increased surface water protections are presented in the table below. These will affect operations with 500 or more animal units.

Proposed NRCS 590 Changes	
Winter Spreading Restrictions	
Current	Proposed
<ul style="list-style-type: none"> 7,000 gal/ac limit No manure spreading <ul style="list-style-type: none"> Within Surface Water Quality Management Area On locally identified areas (e.g. sinkholes) Within 200 ft. upslope of direct conduits to groundwater On slopes > 12% 	<ul style="list-style-type: none"> 7,000 gal/ac limit or 60lbs. P₂O₅, whichever is less No manure spreading <ul style="list-style-type: none"> Within SWQMAs Within 300 ft. of direct conduits to groundwater, not just upslope No liquid manure application in February and March on: <ul style="list-style-type: none"> <u>DNR Well Compensation Areas</u> for manure contamination Soils with 5 ft. or less to Silurian Dolomite (Not in St. Croix County)
Winter Spreading Plan	
<ul style="list-style-type: none"> Requires a winter spreading plan that identifies: <ul style="list-style-type: none"> Areas of fields that don't have a winter restriction ID Fields with low slope and erosion, high roughness, farthest from waters 	

	<ul style="list-style-type: none"> • Capacity for stacking manure that is 16% dry matter without permanent storage • Fields you intend to apply on in winter • Do not apply on slopes greater than 6% or to fields with concentrated flow channels unless 2 specific conservation practices are implemented • Options are intended to deal with one or more of the 4R's <ul style="list-style-type: none"> ○ Right fertilizer source ○ Right rate (3,500 gal/ac) ○ Right time(wait 14 days between applications) ○ Right place
Groundwater	
<ul style="list-style-type: none"> • No manure within 50 ft. of drinking well, unless grazing • Incorporate manure within 200 ft. upslope of direct conduits to groundwater 	<ul style="list-style-type: none"> • No nutrients within: <ul style="list-style-type: none"> ○ 50 ft. of direct conduits to groundwater (within 300 ft., during winter), unless grazing ○ 8 ft. of irrigation wells • Only manure that is treated to substantially eliminate pathogens can be applied within: <ul style="list-style-type: none"> ○ 1,000 ft. of a community potable water well ○ 100 ft. of Non-Community potable water well (church, school, and restaurant) <p>No manure on:</p> <ul style="list-style-type: none"> • Areas identified by the Land Conservation Committee or in a conservation plan as areas contributing to direct conduits to groundwater unless manure is substantially buried within 24 hours of application
Fall Nitrogen Restrictions	
<p>Nitrogen restricted soil types</p> <ul style="list-style-type: none"> • Highly Permeable (Sands) – P • Shallow water table (12 in. from surface any time of year) – W • Shallow bedrock (20 in. from surface) - R 	
<ul style="list-style-type: none"> • When manure is applied to nitrogen restricted soil types, rate limits based on soil temps (50° or Sept 15th) • Application in the fall are limited to either 120 lbs. N/ac or 90 lbs. N/ac (~half the crop need) 	<ul style="list-style-type: none"> • No fall application of commercial nitrogen fertilizer on soils < 5 ft. to bedrock • Rates based on soil temp (50° or October 1st)
Nutrient Management Cost-Share Increase	
\$7 per acre per year for 4 years = \$28/acre	\$10 per acre per year for 4 years = \$40/acre (ATCP 50.42(2)(g))

Source: Sara Walling, DATCP; https://datcp.wi.gov/Pages/Programs_Services/ATCP50RuleRevisions.aspx

Main Findings

- The NRCS 590 standard for NMPs has been adopted by the State, and the County adopted this standard by ordinance. At the State level, nutrient management standards follow ATCP 50.04(3) and NR 151.
- According to DATCP, the percentage of agricultural land with a NMP is 23%. This number will likely rise to 30% when new data is considered this year.
- Farms under 500 animal units not participating in Farmland Preservation Program are not required to have a NMP. The County doesn't regulate and reporting is not required of these small farms.
- The County is critical to enforcement. However, for compliance, DATCP has aimed to support programs with education. It is believed that it is more effective to improve working relationships between farmers and the County rather than use a heavy-handed approach.
- Anyone with a cost-share contract can be required to develop a NMP regardless of farm size.
- All waste removed during animal waste storage facility abandonment is applied using the NRCS 590 standards (agronomic rates).
- The current animal waste storage facility abandonment enforcement process relies almost entirely on education about proper practices and the ability of the county to provide cost sharing.

Part 7 Livestock siting and operations

The County's authority to regulate is limited, and must be found or implied in statute. In Wisconsin, there is a legal separation between the regulation of livestock siting and operations. Wisconsin Statute § 93.90 provides uniform regulation of the siting of livestock facilities across the state. Wisconsin State Administrative Code ATCP 51 interprets Wis. Stat. § 93.90 and contains most siting rules and provides the framework for permits on new or expanded livestock facilities for more than 500 animal units that require local approval. There is no requirement that local government regulate the siting of livestock facilities, but if they do it must be by ordinance and according to the State's siting law.

A County may adopt rules that exceed the standards in the State Siting Law, but only if such standards are based upon "reasonable and scientifically defensible findings of fact, adopted by the political subdivision, that clearly show that the requirement is necessary to protect public health or safety."

St. Croix County provides for livestock facilities in zoning districts Agriculture 1 and Agriculture 2, and as a conditional use in the Rural Residential district. If a farmer wants to establish a new facility or expand an existing facility (20% of animal units), permit applications for Agriculture zoned areas go through the Community Development Department, and for Rural Residential zoned areas through the Board of Adjustment.

The contents of a siting application are fixed, and the County cannot require additional information. There is a maximum fee level and a fixed time to respond to an application. If an application is determined not to be complete, then the County must describe in writing what is missing. After the revised application is resubmitted, then the County has 14 days to determine completeness. A decision on a complete application generally has to be made within 90 days of notifying the applicant of a determination of completeness, however a decision may be delayed for good cause.

A siting application must be approved if it complies with ATCP 51.30. An application may be denied if there is clear and convincing evidence to the contrary. It may also be denied if it violates existing code, such as that for floodplains, shoreland, electrical code, etc.

A County may be able to prohibit livestock facilities or expansions in its zoning regulations if the site is located in a zoning district that is not an agricultural zoning district, or the site is located in an agricultural zoning district in which the proposed new or expanded operation is prohibited. Any prohibition in an agricultural district must be based upon reasonable and scientific findings of fact that clearly show the prohibition is necessary to protect public health or safety.

In general, a County is able to enact regulations on livestock operations so long as they do not exceed standards derived from Wisconsin Statute § 281.16(3). For example, Administrative Code NR 151.08 includes the following prohibitions:

1. That a livestock operation may have no overflow of manure storage structures.
2. That a livestock operation may have no unconfined manure pile in a water quality management area.
3. That a livestock operation may have no direct runoff from a feedlot or stored manure into the waters of the state.
4. That a livestock operation may not allow unlimited access by livestock to waters of the state in a location where high concentrations of animals prevent the maintenance of adequate sod cover.

Variations that exceed State operational requirements are allowed but only if necessary to achieve State water quality standards. Such regulations that exceed State operational standards must obtain the approval of the DNR and DATCP to be in effect. The specific procedures for approval for regulation that exceed State standards are contained within NR 151.096 and ATCP 50.60 and are summarized as follows:

1. Submit a copy of the ordinance to DATCP and DNR.
2. Identify the provisions for which approval is sought.
3. Submit supporting documentation explaining why the specific ordinance provisions that exceed state standards, prohibitions, conservation practices or technical standards are needed to achieve water quality standards, and why compliance cannot be achieved with a less restrictive standard.

Main Findings

- Wisconsin Statute §93.90 provides uniform regulation of the siting livestock facilities across the state.
- Variations that exceed State requirements are allowed but only if necessary to protect public health or safety. Local government must adopt requirements by ordinance prior to application being filed. The conditions to exceed state standards must be based on “reasonable and scientifically defensible findings of facts, adopted by the political subdivision, that clearly show the requirement is necessary to protect public health and safety.”
- State permitting is “one size fits all.” State policies do not account for local variations in soil conditions, geology, watershed characteristics, etc.
- A siting application must be approved if it complies with ATCP 51.30. An application may be denied if there is clear and convincing evidence to the contrary. It may also be denied if it violates existing code, such as that for floodplains, shoreland, electrical code, etc.
- Counties may enact regulations of Livestock Operations that are consistent with and do not exceed the performance standards, prohibitions, conservation and technical standards of State law without DNR and DATCP approval.
- Counties may enact operational regulations that exceed State standards, if such standards are approved by the DNR and DATCP and are necessary to achieve water quality standards.

Part 8 Studies related to the management and protection of groundwater

Kewaunee County Study on Groundwater Contamination

The St. Croix County Ground and Surface Water Study Group was presented with a study that looked at groundwater contamination in Kewaunee County. Kewaunee County has 16 CAFOS, 98,000 cows, and 4,791 septic systems; along with fractured bedrock and thin soils. Kewaunee County is primarily Silurian Dolomite. The study aimed to look at two aspects: source and transport. Sources include bovine manure and human wastewater from septic systems. The transport was infiltrating water. The study assessed contamination in Kewaunee County by looking at four things:

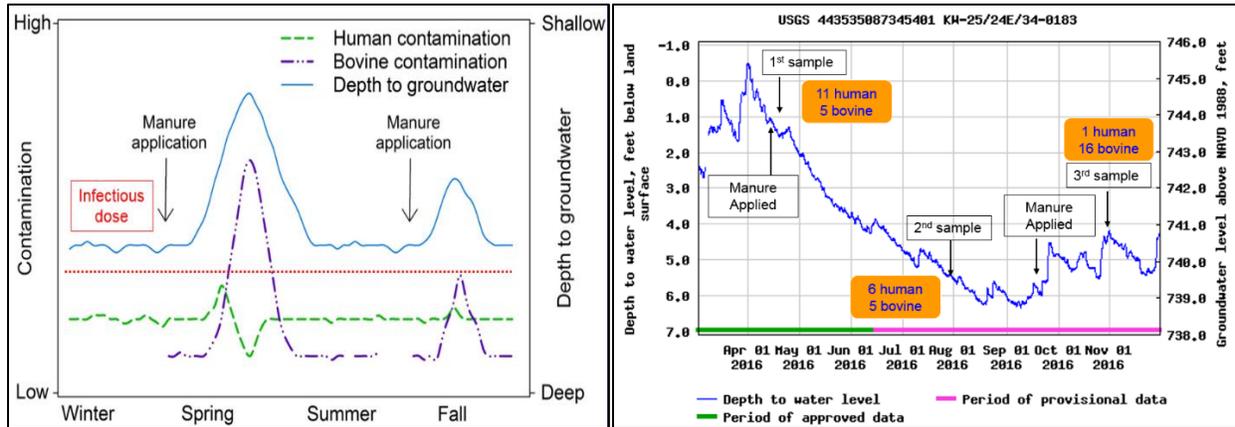
1. Occurrence assessment
2. Source assessment
3. Transport
4. Risk factors (statistical model)

The sampling was limited to 15% of wells due to time, funding, and testing. The overall participation rate was 40%. Larger sample sizes are more representative. The largest limiting factor was funding for research. However, the study did provide a baseline of contamination rates in the county. The rough cost for collecting the data was around \$16-20K and included all analyses and staff to collect samples.

There were two synoptic sampling events, one in November 2015 and one in July 2016. During the first event, 323 wells were sampled and 401 wells were sampled in the second event. All were tested for nitrate, total coliform, and *E. coli*. An assessment of occurrence showed 1/3 of wells tested were contaminated. The study then looked at potential sources of contamination using (Quantitative polymerase chain reaction) qPCR testing. qPCR testing can detect dead pathogens, but that doesn't mean they actually pose a health risk.

This covered 3 events, and involved 86 well samples. The results found that 18 cases showed human contamination, 26 cases showed bovine, and 3 showed both.

If a house is occupied, then there will be a continual release of wastewater into the ground. Alternatively, a bovine can produce nearly 100 lbs. of manure per day, which is spread on the surface and only experiences episodic infiltration from rain and snowmelt. Study results showed contamination levels rising in spring and fall. Septic tanks create constant low-level contamination. Manure is broken up because don't always see it until recharge events drive it into the ground. The study found that during the first sample groundwater test revealed 11 contaminated with human and 5 bovine. The second sample showed 6 hits for human and 5 for bovine. The third sample showed 1 human and 16 hits for bovine. This one study showed that during recharge events, bovine sourced contamination exceeds human. During non-recharge events, human sourced contamination exceeds bovine.



Source: Borchardt, Mark, Sue Spencer, Maureen Muldoon, Joel Stokdyk, Randall Hunt, Aaron Firnstahl, Davina Bonness, and Burney Kieke (2017) "Sources of Fecal Contamination in Groundwater in Rural Northeastern Wisconsin" Presentation given to the St. Croix County Ground and Surface Water Study Group, March 14, 2017.

Main Findings

- If a house is occupied, then there will be a continual release of wastewater into the ground. Alternatively, a bovine can produce nearly 100 lbs. of manure per day, which is spread on the surface and only experiences episodic infiltration from rain and snowmelt.
- For the study site, during recharge events, bovine sourced contamination exceeded human. During non-recharge events, human sourced contamination exceeded bovine.

The Study Group's Final Core Recommendations

The eight core recommendations identified by the Study Group are (in no particular order):

- Explore options regarding the regulation of livestock operations and licensing for facility siting for ongoing monitoring of livestock operations for the purpose of protecting water resources.
- Increase the number of acres in nutrient management plans (NMPs).
- Revise the County's land use policy and zoning ordinances to protect groundwater resources by:
 - Exploring options for adopting each of five levels of authority for regulating well design and construction, as specified in NR 845.05;
 - Exploring options to update well construction standards, including casing, depth, grouting and well casing down to water source, as well as improving data quality;
 - Separating incompatible land uses;
 - Varying lot size requirements in environmentally sensitive areas;
 - Establishing groundwater recharge zones; and,
 - Encouraging common POWTS and shared wells constructed to a higher standard.
- Develop a county protocol for urgent response to actual or potential water resource pollution events that threaten human health, the environment, or natural resources.
- Develop a scientifically sound drinking water well testing program to create baseline data to measure drinking water quality over time, including:
 - Consistent recording of pertinent data;
 - Maintaining and improving the county database of all well construction records and water test information; and,
 - Increasing participation in the existing drinking water well testing program
- Identify and map environmentally sensitive areas and conduits to groundwater to improve siting of POWTS, wells, spreading, etc. Map closed depressions, sinkholes, and karst. Develop, update, improve, or publish data and maps for depth to bedrock, recharge, discharge, aquifers, etc., and provide information to the state for implementation in the SnapPlus program. Map areas with high vulnerability to agricultural and a variety of pollutants.
- Develop a plan with cost estimates for constructing another inset model for areas of interest and concern. Conduct research to determine sources of nitrate issues, distinguishing between non-agricultural or agricultural sources.
- Establish active water quality committee to ensure that the protection of ground and surface water continues to be a priority issue actively addressed by the County.

Annex: List of Presentations

Juckem, Paul, Hydrologist, USGS – Wisconsin Water Science Center. “St. Croix County Hydrogeology”

Masarik, Kevin, Center for Watershed Science and Education. “Groundwater and Well Water: St. Croix County”

Olson, Steve, Certified Crop Advisor, St. Croix County. “County Ordinances Pertaining to Agriculture and Nutrient Management”

Sterry, Ryan, Agriculture Educator, UW-Extension. “Nutrient Management Summary”

Walling, Sara, Chief, Wisconsin Department of Agriculture, Trade, and Consumer Protection. “DATCP’s Role in Water Quality and Nonpoint Pollution Reduction”

Wittmer, Tammy, Land Conservation Planner, St. Croix County. “Groundwater Education Programs”

Yarrington, Ryan –Land Use Specialist, St. Croix County. “POWTS: Private Onsite Wastewater Treatment Systems”

Annex: Full Set of Recommendations Identified by the Study Group (Unedited)

Revise Policy

Objective: 1.1 Manage Nutrients and Pollutants

Recommendations to continue implementing as an ongoing priority	Additional Resources
Create or amend ordinances to reflect new state performance standards, regulate livestock operations, and facility siting licensing for ongoing monitoring of livestock operations.	Staff/\$
Develop a strategy to increase number of acres in nutrient management plans (NMPs).	\$/Staff
Recommendations to begin implementing in the short-term (0-2 years)	
Revise county land use policy and county zoning ordinances to protect groundwater resources by: Separating incompatible land uses Varying lot size requirements in environmentally sensitive areas Establish groundwater recharge zones Encourage common POWTS and shared wells constructed to a higher standard (The county is in the process of a comprehensive revision of zoning ordinances.)	
Recommendations to begin implementing in the long-term (3-5 years)	
Reevaluate and revise the how, when, and where for the county's current fertilizer spreading and application guidelines (or ordinance, also look at schools, hospitals, etc.). Consider exemptions for small farms that have no storage. For CAFOs, may need to explore a system to track private spreaders.	

Objective: 1.2 Optimize Procedures

Recommendations to begin implementing in the short-term (0-2 years)	Additional Resources
Develop a County protocol for urgent response to actual or potential water resource pollution events that threaten human health or the environment/natural resources.	

Measure Consistently

Objective: 2.1 Inventory

Recommendations to continue implementing as an ongoing priority	Additional Resources
Continue to map all NMPs using the County's GIS and SnapPlus nutrient management software.	Staff/\$
Update county-wide LIDAR data on a regular 5 or 10 -year cycle	\$
Recommendations to begin implementing in the short-term (0-2 years)	
Develop a scientifically sound drinking water well testing program to create baseline data to measure drinking water quality over time. Consistently record pertinent data. Maintain and improve the county database of all well construction records and water test information. Increase participation in the existing drinking water well testing program. (A County well construction ordinance can improve data quality.)	Staff/\$
Identify and map environmentally sensitive areas and conduits to groundwater to improve siting of POWTS, wells, spreading, etc. Map closed depressions, sinkholes, and karst. Develop, update, improve, or publish data and maps for depth to bedrock, recharge, discharge, aquifers, etc., and provide information to the state for implementation in the SnapPlus program.	Staff/\$
Create a database of wells that may need proper abandonment.	Staff/\$
Recommendations to begin implementing in the long-term (3-5 years)	Additional Resources
Establish and install more groundwater monitoring wells.	\$
Complete the culvert inventory for the County to understand surface water flow.	Staff/\$

Objective: 2.2 Analysis

Recommendations to begin implementing in the short-term (0-2 years)	Additional Resources
Map areas with characteristics connected to higher vulnerability to agricultural and a variety of pollutants.	Staff/\$
Propose another inset model for areas of interest and concern. Learn how to use the groundwater flow model with training from Paul Juckem. Conduct research to determine source of nitrate issues, distinguishing between residential or agricultural.	\$

Advocate State & Federal Level

Objective: 3.1 Federal

Recommendations to continue implementing as an ongoing priority	
Advocate for greater participation and funding in the conservation reserve program and extend length of contracts; ability to tie crop insurance to conservation practices.	County Board
Recommendations to begin implementing in the short-term (0-2 years)	
Create advocacy for ongoing Farm Bill negotiations County Board.	County Board

Objective: 3.2 State

Recommendations to begin implementing in the long-term (3-5 years)	
Advocate for laws and rule changes requiring the County to receive SnapPlus files from consultants.	County Board
Provide one elected official from St. Croix County to join WIDNR Drinking Water and Groundwater Study Group.	County Board
Lobby state to raise standards for POWT construction (e.g. denitrification technologies).	County Board
Advocate the state to allow each county to make new and existing high-capacity wells subject to an annual permitting requirement so the impact of these wells on the region can be taken into consideration.	County Board
Advocate the state to allow each county to charge an annual fee for the consumption of water via high-capacity wells.	County Board

Cooperate Locally

Objective: 4.1 Outreach

Recommendations to begin implementing in the long-term (3-5 years)	
Develop, revise and deliver educational outreach on Best Management Practices for fertilizer run-off, including use of cover crops, cost-share for cover crops, properly abandoning animal waste storage structures, adding organic matter (e.g. sludge or biosolids, reduce tillage, taking hay out of rotation, no manure, etc.), delaying spraying until crops are up, proper placement, amount, and timing for fertilizer applications, NMPs, diverse crop rotation, pre-spreading meetings and rain gardens.	Staff/\$
Create or make available educational guides, publications, and videos concerning POWTS, septic systems (options and costs), suboptimal treatment from 'standard' technology, status of water resources, pollutant sources, contamination levels, rural living. Produce a publication or video about getting ready for POWTS focused on realtors to share with buyers.	Staff/\$

Objective: 4.2 Develop Communities

Recommendations to begin implementing in the short-term (0-2 years)	
Re-establish active committee on Land and Water Conservation to ensure the issue stays on the radar. (The Community Development Committee under County Board Rules and By-laws has land and water conservation oversight. Additional standing committees would require staff support.)	Staff/\$
Recommendations to begin implementing in the long-term (3-5 years)	
Explore opportunities to protect water quality with inter-county cooperation and conduct research of possible inter-county sources of pollution.	County Board
Work with local land trust organizations to (develop) purchase of development rights to protect groundwater quality.	Staff/\$

Administrate Proactively

Objective: 5.1 Enhance Administrative Capacity

Recommendations to continue implementing as an ongoing priority	
Support sufficient staff and funding levels required for completing databases and mapping projects, compliance, strong public relations, accountability, conservation projects, ensuring animal waste storage facilities' integrity, and full-time monitoring and regulation of NMPs.	Staff/\$

Objective: 5.2 Explore Alternative Solutions

Recommendations to begin implementing in the short-term (0-2 years)	
Research options for adopting each of five levels of authority for regulating well design and construction, as specified in NR 845.05. Research options to update well construction standards, including casing, depth, grouting and well casing down to water source.	Staff/\$
Recommendations to begin implementing in the long-term (3-5 years)	
Explore regulatory options or incentives to require or promote shared wells/septic systems.	
Investigate the county's role related to manure digester use and expansion.	
Explore developing a County Water Quality Trading Program to allow new or expanding operations to purchase phosphorus credits to offset a planned increase in phosphorus to surface waters.	
Partner with city and villages in developing TMDL Adaptive Management Plans.	Staff/\$
Encourage cities and villages to map and create well-head protection zones for municipal wells.	

Annex: Legal Summary Tables

Federal Law as basis for managing and protecting surface and ground water in the US

Clean Water Act, 33 U.S.C. §1251 et seq. (1972)

Discharges to Water	The Clean Water Act (CWA) specifies that it is unlawful for pollutant discharges from point sources into navigable waters without a permit. Discharges are controlled by the National Pollutant Discharge Elimination System (NPDES). Permits are needed if discharges are directly to surface water.
	Animal Waste and Illegally Discharging pollutants to water is one of EPA's National Enforcement Initiatives. The CWA directs the EPA to use innovative monitoring and targeting techniques to identify areas where CAFOs impair natural resources or adversely impact communities and to promote technologies to address this problem. Under this law, only CAFOs that discharge are required to get NPDES permits.
	Wastewater Management: The CWA deals with discharges from municipal and industrial treatment plans. Including storm water discharges from industrial facilities and municipalities
	Wetlands: Discharges of Dredge and Fill Material. The EPA is directed to ensure that material are not discharged into wetlands and other waters of the US, except as authorized by the USACE.
Standards	Title 40: Protection of Environment, Part 131 - States adopt water quality standards to protect public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act (the Act). "Serve the purposes of the Act" (as defined in sections 101(a)(2) and 303(c) of the Act) means that water quality standards should, wherever attainable, provide water quality for the protection and propagation of fish, shellfish and wildlife and for recreation in and on the water and take into consideration their use and value of public water supplies, propagation of fish, shellfish, and wildlife, recreation in and on the water, and agricultural, industrial, and other purposes including navigation. Such standards serve the dual purposes of establishing the water quality goals for a specific water body and serve as the regulatory basis for the establishment of water-quality-based treatment controls and strategies beyond the technology-based levels of treatment required by sections 301(b) and 306 of the Act.
	Title 40, Section 131.4 gives authority to states for reviewing, establishing and revising water quality standards, Section 131.5 gives EPA the authority to approve or disapprove state-adopted standards based on whether the are consistent with the Clean Water Act, among other criteria.
	Section 303 D mandates states to identify Total Maximum Daily Loads (TMDL's) of Phosphorous for waterbodies not meeting water quality standards.
Authority Granted to States	Section 319 mandates that states prepare an assessment and management program for controlling pollution from non-point sources
	State delegate authority to administer CWA under Wis. Stat. Ch. 283. EPA retains right to review and object to individual permit if it doesn't meet requirements of CWA. EPA can also revoke entire state delegation for administering and enforcing program.
Safe Drinking Water Act, 42 U.S.C. §300f et seq. (1974)	
Standards	All waters actual or potentially designed for drinking use, surface and groundwater. Authorizes EPA to establish minimum standards. Standards must consider risk and cost assessments, and peer-reviewed science. EPA establishes minimum standards for state programs to protect underground sources of drinking water from endangerment by underground injection of fluids. "Maximum Contaminant Levels" for 75 substances.
Monitoring	Safe Drinking Water Act compliance monitoring program includes onsite visits by qualified inspectors, reviews of required information from the state. Provides tools to business, federal facilities, and local governments to meet regulatory requirements. Requires Consumer Confidence Reports. This applies to public drinking water systems, defined as government or private companies that supply water to 25 people or 15 service connections. This does not apply to private wells.

Principles and policies delegating authority at different levels of government

FEDERAL	
Surface Water	Clean Water Act, 33 U.S.C. §1251 et seq. (1972) Title 40: Protection of Environment, Part 131 - Water Quality Standards: States adopt water quality standards to protect public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act (the Act). These standards serve the dual purposes of establishing the water quality goals for a specific water body and serve as the regulatory basis for the establishment of water-quality-based treatment controls and strategies beyond the technology-based levels of treatment.
Drinking Water	Safe Drinking Water Act, 42 U.S.C. §300f et seq. (1974) All waters actual or potentially designed for drinking use, surface and groundwater. Authorizes EPA to establish minimum standards. Standards must consider risk and cost assessments, and peer-reviewed science. EPA establishes minimum standards for state programs to protect underground sources of drinking water from endangerment by underground injection of fluids. "Maximum Contaminant Levels" for 75 substances.
Definitions	Reasonable Use: Restatement (Second) of Torts §858 - Describes the Reasonable Use Doctrine as based on Common Law: groundwater is owned by the landowner. It combines concept of non-liability with reasonable use. 1) withdrawal interferes with the withdrawal of other owners by lowering the water table, 2) withdrawal interferes with lakes, rivers, and streams that depend on groundwater, or 3) withdrawal results in pumping more than the owner's reasonable share.
	Public Trust Doctrine is the principle that certain natural and cultural resources are preserved for public use, and that the government owns and must protect and maintain these resources for the public's use.
STATE	
Policies	Wisconsin Constitution Article IX, Sect. 1: State adopts Public Trust Obligation for all Navigable Waters. Does not extend to groundwater. Wisc Stat §227.10(2m) Public Trust for protection of state water lies with the legislature unless explicitly assigned to an agency. See OAG-01-16 for a full explanation.
	Wisc Stat §283.001(1) Establishes the policy of this state to restore and maintain the chemical, physical, and biological integrity of its waters to protect public health, safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, agricultural, and other uses of water.
	Wisc Stat §160.001 establishes the intent to minimize polluting substances in groundwater through the use of numerical standards in all groundwater regulatory programs to protect public health and welfare.

Principles and policies delegating authority at different levels of government (Con't)

	STATE AUTHORITY	STATE LINE AGENCIES	COUNTY
Department of Natural Resources	Wisc Stat §281.11 Established DNR 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.	Wisc Stat §280 DNR will prescribe and enforce minimum reasonable standards, rules, and regulation for methods to obtain drinking water for human consumption, to establish safeguards to protect public health against polluted sources, including minimum reasonable standards for construction of well pits. DNR shall have general supervision and control of all methods of obtaining groundwater for human consumption including sanitary conditions surrounding the same, the construction or reconstruction of wells and generally to prescribe, amend, modify or repeal any rule or regulation theretofore prescribed and shall do and perform any act deemed necessary for the safeguarding of public health.	NR 845.02 Applies to all counties with a department-approved well construction or pump installation ordinance regulating new and existing private water systems. NR 845.05 designates 5 levels of private well regulation available to Counties.
Department of Agriculture, Trade and Consumer Protection	Wisc Stat §92.02(2) Makes it state policy to halt and reverse the pollution of state waters from non-point sources of pollution. 281.65 "Nonpoint source" means a land management activity which contributes to runoff, seepage or percolation which adversely affects or threatens the quality of waters of this state.	Wisc Stat §92.03(3) establishes the Department of Agriculture, Trade and Consumer Protection as the responsible state agency.	Wisc Stat §92.06 Each County shall establish a Land Conservation Committee. Wisc Stat §92.07(2) Committee may develop and adopt standards and specification for management practices to control erosion, sedimentation, and nonpoint source pollution.
Department of Safety and Professional Services	Wisc Stat §1.11 Requires all state agencies to consider the environmental impacts of their legislation and actions.	Wisc Stat §145.02 Assigns the Department of Safety and Professional Services the responsibility that POWTS shall be safe, sanitary and such as to safeguard the public health and the waters of the state.	Wisc Stat §145.01(5) Governmental unit responsible for the regulation of private on-site wastewater treatment systems means the county, except that in a county with a population of 750,000 or more.
Department of Transportation	Wisc Stat §160.26 Regulatory agencies shall enforce the provisions of Chapter 160.	Wisc Stat §85.18 requires the Department of Transportation to comply with the requirements of Wisc Stat § 160 in the administration of any program, responsibility, or activity assigned or delegated to it by law.	

Regulatory Authority of Department of Natural Resources Related to Groundwater Management

Department of Natural Resources	
Discharge	Wisc Stat §283.001(2) Grants to DNR all authority necessary to establish, administer and maintain a state pollutant discharge elimination system to effectuate the policy set forth under sub. (1) and consistent with all the requirements of the federal water pollution control act amendments of 1972.
Regulatory Authority Granted by the State	Wisc Stat §160.001 establishes the intent to minimize polluting substances in groundwater through the use of numerical standards in all groundwater regulatory programs to protect public health and welfare.
	Wisc Stat §160.001(4) Allows regulatory agencies to establish any type of regulation for activities and facilities that achieve the intent.
	Wisc Stat §160.05(1) Requires all regulatory agencies to submit a list of substances related to facilities, activities, and practices which are detected or have a reasonable probability of entering groundwater resources of the state.
	Wisc Stat §160.07 Each regulatory agency must establish enforcement standards. (4) Department of Health and Human Services shall develop recommendations for enforcement standards (typically follow Federal Guidelines).
	Wisc Stat §160.19(2) Each regulatory agency shall make rules defining design and management practice criteria for facilities, activities, and practices affecting groundwater, in consideration of technical and economic feasibility.
	Wisc Stat §160.21(4) Regulatory responses for groundwater contamination must consider 1) risk-benefit criteria, 2) hydrogeological conditions, and 3) Management and practice conditions.
	Wisc Stat §160.26 Regulatory agencies shall enforce the provisions of Chapter 160.
	Wisc Stat §160.27 DNR will establish and operate a system for monitoring and sampling groundwater.
	Wisc Stat §160.27(4) DNR will coordinate the collection of groundwater monitoring data and the exchange of data among agencies.
Standards	NR 140.01 Groundwater Quality: The purpose of this chapter is to establish groundwater quality standards for substances detected in or having a reasonable probability of entering the groundwater resources of the state; to specify scientifically valid procedures for determining if a numerical standard has been attained or exceeded; to specify procedures for establishing points of standards application, and for evaluating groundwater monitoring data; to establish ranges of responses the department may require if a groundwater standard is attained or exceeded; and to provide for exemptions for facilities, practices and activities regulated by the department.
	NR 140.02(2) DNR may adopt regulations that establish specific design and management criteria for regulated facilities and activities.

Private Onsite Wastewater Treatment Systems

Delegation of Authority	
State Authority	Wisc Stat §145.02 Assigns the Department of Safety and Professional Services the responsibility that POWTS shall be safe, sanitary and safeguard the public health and waters of the state.
County Authority	Wisc Stat §145.01(5) Governmental unit responsible for the regulation of private on-site wastewater treatment systems means the county, except that in a county with a population of 750,000 or more.
	Wisc Stat §145.20 County is authorized to assign duties of administering POWTS to a department, committee, board, office, position, or employee.
	County Ordinance Chapter 12: Promotes and protects public health, environment, safety, and general welfare, and further maintenance of safe and healthful conditions for the County. Applies to the whole county except for areas owned by the state and federal government. Incorporates Wisconsin State standards. Discusses permitting, inspections, and zoning.
Standards	SPS 383.01 Purpose. The purpose of this chapter is to establish uniform standards and criteria for the design, installation, inspection, and management of a private onsite wastewater treatment system, (POWTS), so that the system is safe and will protect public health and the waters of our state.
	Wisc Stat §145.02(1) The construction, installation and maintenance of plumbing shall be safe, sanitary, and such as to safeguard public health and waters of the state. Prescribe and enforce reasonable standards that are uniform and statewide. Certification rules for soil testers and plumbers.
	Wisc Stat §160.255(2) and (4) (Groundwater Exceptions for POWTS) Regulatory agencies are not required to make rules for design or management criteria to minimize nitrates in groundwater or to maintain compliance with the Preventive Action Limit (PAL) for Nitrate, or to make rules for agency responses when the PAL of nitrate is attained or exceeded.
	Wisc Stat §145.245(4) established that DSPS will establish the criteria for determining when a POWTS is failing.
Permits	Wisc Stat §145.19 States that the purchase or installation of a POWTS shall require a Sanitary Permit, to be issued by DSPS or authorized government unit.
	WI Stat 145.20(3)(c) The Department can review compliance with state regulations and prohibit issuance of Sanitary permits until violations are corrected.
Rehabilitate and Replace	Wisc Stat §145.245(5) Conditions for eligibility for a grant for system replacement or rehabilitation.

Wells (Private, Public, High-Capacity, and Monitoring)	
Delegation of Authority	
Department of Natural Resources	NR 812.01 Establishes uniform minimum standards and methods in conformity for obtaining and extracting groundwater, protecting groundwater and aquifers from contamination through adequate construction and reconstruction of water systems; and evaluating, locating and identifying wells at the time of property transfer. Governs the locations, construction, maintenance, and inspection of wells, the filling and sealing of wells, and the installation and maintenance of pumping and treatment
	NR 812.02 Well Construction and Pump Installation: Applies to all new and existing water systems and drill holes with the following exceptions: wells under NR 141 (Groundwater Monitoring Wells), unless high capacity wells, community water systems under NR 809, 810, and 811 (Public and Community Water Systems), and Nonpotable surface water systems.
Public Water Systems	
Standards	NR 809.01 establish minimum standards and procedures for the protection of the public health, safety and welfare in the obtaining of safe drinking water (Public Water Systems Only).
	NR 812.08(4) Minimum Distance specifications for wells relative to contamination sources.
High-Capacity wells	
Definition	NR 812.07(53) “High capacity well system” means one or more wells, drill holes, or mine shafts used or to be used to withdraw water for any purpose on one property, if the total pumping or flowing capacity of all wells, drill holes, or mine shafts on one property is 70 or more gallons per minute based on the pump curve at the lowest system pressure setting, or based on the highest flow rate from a flowing well or wells.
Regulatory Limitations	Wisc Stat §227.10(2m) This section restricts any agency from implementing or enforcing any standard, requirements, or threshold, including a term or condition of any license unless it has been explicitly required or permitted by statute or rule.
Permits	NR 812.09(4)(a) & (b) prior DNR approval is necessary for the construction or operation of a high capacity well system, school well or wastewater treatment plant well.
	Wisc Stat §281.34(2) An owner of a high capacity well must apply for a withdrawal permit before construction can begin.
	Wisc Stat §281.34(5m) Prohibits challenging approval of a high capacity well based on a lack of consideration of the cumulative environmental impacts of that high capacity well together with existing wells.
	Wisc Stat §281.34(4) Describes the specific cases that require an environmental review (i.e. in groundwater protection area, water loss of more than 95% of the amount withdrawn, or significant impact on a spring).
	Wisc Stat §281.34(10) Does not give permission for DNR to require monitoring as part of High Capacity Well permits.

Wells (Private, Public, High-Capacity, and Monitoring) - Con't	
Private Wells	
Fed	The EPA does not regulate private drinking wells. It is the responsibility of the homeowner to maintain the safety of their water.
County	NR 845.02 Applies to all counties with a department-approved well construction or pump installation ordinance regulating new and existing private water systems.
	NR 845.05 designates 5 levels of private well regulation available to Counties.
Definition	NR 845.04 Private wells are not part of the public water supply system. They have fewer than 15 service connections or regularly serve less than 25 individuals.
Standards	NR 845. 01 Establish standards for county adoption and enforcement of an ordinance for private well location, well construction, well abandonment or pump installation and for department review of county delegation programs. The goal of the county delegation program is to protect Wisconsin's drinking water and groundwater resources by governing access to groundwater through regulating private well location, construction and abandonment and pump installation and well and drill hole abandonment.
	Wisc Stat §280 DNR will prescribe and enforce minimum reasonable standards, rules, and regulation for methods to obtain drinking water for human consumption, to establish safeguards to protect public health against polluted sources, including minimum reasonable standards for construction of well pits. DNR shall have general supervision and control of all methods of obtaining groundwater for human consumption including sanitary conditions surrounding the same, the construction or reconstruction of wells and generally to prescribe, amend, modify or repeal any rule or regulation theretofore prescribed and shall do and perform any act deemed necessary for the safeguarding of public health .
	NR 812.06 DNR can designate private or non-community water systems as contaminated, if contaminate levels are in excess of primary drinking water standards.
Monitoring Wells	
Standards	NR 141.01 establish minimum acceptable standards for the design, installation, construction, abandonment and documentation of groundwater monitoring wells.

Agriculture (Nutrient Management Plans, Animal Waste Storage, and Run-off)

Delegation of Authority

State and County	Wisc Stat §92.02(2) Makes it state policy to halt and reverse the pollution of state waters from non-point sources of pollution. According to Wisc Stat §281.65 "Nonpoint source" means a land management activity which contributes to runoff, seepage or percolation which adversely affects or threatens the quality of waters of this state.
	Wisc Stat §281.11 Established DNR 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.
	Wisc Stat §92.03(3) establishes the Department of Agriculture, Trade and Consumer Protection as the responsible state agency.
	Wisc Stat §92.06 Each County shall establish a Land Conservation Committee. Wisc Stat §92.07(2) Committee may develop and adopt standards and specification for management practices to control erosion, sedimentation, and nonpoint source pollution. In St. Croix County this responsibility is assigned to the Community Development Committee.

Rule Making and Standards

USDA	Natural Resources Conservation Service (USDA) established standards of best practice for nutrient management in Code 509.
DNR and DATCP	Wisc Stat §281.16(3)(a) DNR and DATCP shall promulgate rules prescribing performance standards and prohibitions for agricultural facilities and agricultural practices that are nonpoint sources. The performance standards and prohibitions shall be designed to achieve water quality standards by limiting nonpoint source water pollution.
DNR	NR 243.01 to implement design standards and accepted management practices and to establish permit requirements and the basis for issuing permits to CAFOs. This chapter also establishes the criteria under which the department may issue a notice of discharge or a permit to other animal feeding operations that discharge pollutants to waters of the state or fail to comply with applicable performance standards and prohibitions in Ch. NR 151. For other animal feeding operations, it is the intent of the department that a permit would be issued only when it can be demonstrated that an operation has a discharge of pollutants to waters of the state.
	NR 151 establishes runoff pollution performance standards for non-agricultural facilities and transportation facilities and performance standards and prohibitions for agricultural facilities and practices designed to achieve water quality standards.
Department of Agriculture, Trade, and Consumer Protection	Wisc Stat §92.05(3)(k) DATCP will establish rules to improve agricultural nutrient management, consistent with 281.16(3).
	Wisc Stat §281.16(3)(b) DATCP shall promulgate rules prescribing conservation practices to implement the performance standards and prohibitions.
	Wisc Stat §281.16(3)(c) DATCP shall develop and disseminate technical standards to implement the performance standards and prohibitions.
	ATCP 31 deals with groundwater protection addressing testing and regulatory response and enforcement for fertilizers and pesticides.
	ATCO 50 deals with Soil and Water Resource Management addresses conservation practices to implement DNR performance standards. DATCP must also establish solid conservation and farm nutrient management requirements.
	ATCP 50.04 addresses specific farm conservation practices including nonpoint source pollution control. Erosion control and nutrient management plans.
	ATCP 51 deals with Livestock Facility Siting and applies to local approvals of new or expanded facilities that will have 500 or more animal units. Local approval, if required, must grant or deny based on this chapter. Local approval cannot be required for new or expanded facilities that are smaller than 500 animal units.

Agriculture (Nutrient Management Plans, Animal Waste Storage, and Run-off) - Con't

County	Wisc Stat §92.11(1) A County may enact ordinances for the regulation of land use, land management, and pollutant management practices.
	Wisc Stat §92.15(2) A County may enact regulations of livestock operations that are consistent with and do not exceed the performance standards, prohibitions, conservation practices, and technical standards under Wisc Stat §281.16(3).
	Wisc Stat §92.15(3) A County may enact regulations of livestock operations that exceed performance standards, prohibitions, conservation practices, and technical standards in 281.16(3) only if local governmental unit demonstrates to the satisfaction of DATCP or DNR that regulations are necessary to meet water quality standards under Wisc Stat §281.15.
	Wisc Stat §92.16 A County can enact an ordinance requiring manure storage facilities constructed after July 2, 1983 to meet technical standards of the county or DATCP. DATCP will adopt rules for ordinances setting standards and criteria for construction of manure storage facilities.
	Wisc Stat §93.90 a county, town, city or village ("political subdivision") may not prohibit or disapprove a new or expanded livestock facility of any size unless one of the following applies: - The site is located in a zoning district that is not an agricultural zoning district. - The site is located in an agricultural zoning district where the livestock facility is prohibited. A prohibition, if any, must be clearly justified on the basis of public health or safety. The livestock facility siting law limits exclusionary zoning based solely on livestock facility size. - The proposed livestock facility violates a valid local ordinance adopted under certain state laws related to shoreland zoning, floodplain zoning, construction site erosion control or stormwater management. - The proposed livestock facility violates a local building, electrical or plumbing code that is consistent with the state building, electrical or plumbing code for that type of facility. - The proposed livestock facility will have 500 or more "animal units" (or will exceed a lower permit threshold incorporated in a local zoning ordinance prior to July 19, 2003), and the proposed facility violates one of the following: <ul style="list-style-type: none"> • A state livestock facility siting standard adopted by the department under this chapter. • A more stringent local ordinance standard enacted prior to the siting application.
	County Ordinance Chapter 11 - Animal Waste Storage Facilities. The purpose of the Ordinance is to regulate animal waste storage facilities and operations, and to regulate the location, siting, design, construction, inspection, installation, management, alteration and utilization of such facilities, and the use and application of waste from these facilities, in order to prevent pollution of the County's surface and groundwater to protect public health, environment, safety, and general welfare.
	County Ordinance Chapter 17 - Zoning. Outlines the permissible uses for a property, permissible lots size, height of building and dimensions of required yards and open space. Describes the conditions for Ag-1 Agricultural District, AG-2 Agricultural District, and Rural Residential District.

Annex: Complete Suggested Edits from Citizen Member Carol Johnson

On September 26, 2017, at the final meeting of the Groundwater Study Group, citizen member Carol Johnson submitted numerous suggested edits to the group. Due to time limits on the meeting, it was not possible for the group to consider the full collection of suggestions. However, in order to preserve this input, Carol Johnson's entire set of suggestions are presented in in this annex.

Suggested Edits/Revisions to Draft Final Report
on Background, Main Findings, and Recommendations
Submitted by Carol Johnson, Citizen Member
Groundwater Quality Study Group
September 26, 2017

Page 3: Introduction, paragraph 1:

At its December 6, 2016, the County Board of Supervisors conducted a Public Hearing on a "Moratorium Ordinance on the Establishment or Expansion of Large Livestock Facilities". A motion was made, seconded, and passed (Yes - 15; No - 4) to Amend the Original Resolution on the moratorium to instead create a "Special Study Group to Address Nutrient Pollution-Large Livestock Facilities".

Page 4: Add August and September Meetings:

8/8/2017 Facilitated discussion to develop recommendations for protection of groundwater quality in St. Croix County

8/22/2017 Presentation on Experience with Groundwater Quality Protection in Kewaunee County. Kewaunee County Water Crisis Powerpoint Updated 8-15-17 by Lee Luft, Kewaunee County Board Supervisor. Kewaunee County
Facilitated discussion to develop recommendations for protection of groundwater quality in St. Croix County

9/12/2017 Facilitated discussion to develop recommendations for protection of groundwater quality in St. Croix County

9/26/2017 Facilitated discussion and revision of draft final report on Background, Main Findings, and Recommendations. Groundwater Background and Findings Full Report draft 9.21.2017.
Vote on accepting draft final recommendation report.
Wrap-up discussion and next steps.

Page 5: Part 1: The Groundwater Situation in St. Croix County

Comments: The chart on Page 13 “Sanitary Permits Issues per Years” indicates in 2016 new residences in rural areas was 241. The first paragraph is misleading in that it does not break out the increase in population in rural vs. urban areas. We need to delineate between rural vs. urban population increases and clarify the types/sizes of farming operations that are decreasing. My assumption is that there may be decreasing farming operations and less overall cows but due to increase in Industrialized Large Livestock Facilities that concentrate animals in a specific location contain most of the animals. This discussion does not clarify those factors and it needs to in order to understand all of the factors involved in the threat to groundwater quality. Suggested revision to the first paragraph:

St. Croix County is one of the fastest growing counties in Wisconsin. In 2016, it had an estimated population of 88,029 people, which comprises 35,224 housing units. This includes _____ within urban areas served with wastewater treatment plants and city well water; and _____ within rural areas that are served with private on-site septic systems and wells. Since 2010, the overall population in the county has increased 4.3%

The rural agricultural community is currently comprised of ____ family-owned and operated farms, of which ____ are dairy farming operations with not more than 500 animal units (an animal unit is an equivalency determination based on animal weight, as shown in the following Table 2B from ATCP 51, Worksheet 1 - Animal Units:

TABLE 2B Individual Animal Unit Calculation Equivalencies		
Animal Type	Individual Animal Equivalent of 1,000 Animal Units	Individual Animal Unit Equivalency Factor
Dairy Cattle:		
Milking and Dry Cows	700	1.43
Heifers (400 to 1200 lbs)	1000	1.0
Veal Calves:		
Per Animal	1000	1.0
Beef Cattle:		
Steers, Bulls or Cows (400 lbs to Mkt)	1000	1.0
Swine:		
Pigs (55 lbs to Mkt)	2500	0.4
Pigs (up to 55 lbs)	10000	0.1
Sheep:		
Per Animal	10000	0.1
Horses:		
Per Animal	500	2.0
Ducks:		
Per Bird (Liquid poultry manure handling)	5000	0.2
Per Bird (Non-liquid poultry manure handling)	30000	0.0333
Chickens:		
Per Bird (Liquid poultry manure handling)	30000	0.0333
Layers (Non-liquid poultry manure handling)	82000	0.0123
Broilers and Pullets (Non-liquid poultry manure handling)	125000	0.008
Turkeys:		
Per Bird	55000	0.018

History: CR 05-075: cr. Register April 2007 No. 616, eff. 7-1-07.

Focusing on dairy cows, St. Croix County's agricultural community is currently comprised of 7 Large Livestock Facilities comprising about 8,570 dairy cows, or 12,000 animal units. These facilities range in size from _____ dairy cows to _____ dairy cows per facility. According to county records, there are approximately 20,000 dairy cows in the county. That leaves about 11,430 dairy cows on the remaining

dairy farms that under the 500 animal units (about 357 dairy cows) threshold. These dairy farms range in size from ____ dairy cows to ____ dairy cows.

Last Paragraph:

In St. Croix County, groundwater is primarily recharged within the county meaning the sources of recharging of the groundwater must be protected in order to protect residential water supply. Groundwater is the sole source of residential water supply. As shown in the following chart “St. Croix County Groundwater Budget”, St. Croix County’s ground and surface waters are interconnected with 57-91% of annual streamflow generated from groundwater. Likewise, 82% of groundwater in the county is from in-county recharging and 15% from flowing rivers through the county. Only 4% of St. Croix’s groundwater is sourced from outside of the county boundaries.

Page 6: First Paragraph:

The most prevalent problem that we know of with groundwater quality in the county relates to increasingly high and, in some cases, dangerous levels of nitrates (e.g., water tests of the Emerald Town Hall have shown nitrates levels of 6.9 ppm in 2007 at the time the town hall well was installed; in April of 2017, testing revealed a level of nitrates at 27 ppm. Well testing data collected by the UW Extension Stevens Point and as presented by Kevin Masarik show high levels of nitrates in several of the county’s townships. While high levels of nitrates has been documented, recent well testing in the Dry Run area, located within the St. Croix River Watershed District, has indicated e-coli contamination, which is often an indication that other bacterial contamination may be present. More detailed testing is required in order to determine the DNA of the contamination before a possible source can be determined. At the time of writing this report, the State DNR has refused to conduct further analysis and the burden of correcting or replacing the wells lies solely on the private property owners.

Second Paragraph:

Current mapping indicates that St. Croix County has significant areas of karst feature. However, mapping of specifically located features has not yet been undertaken. Sinkholes are a particular concern as they can provide a direct conduit into the groundwater. Identifying sinkholes requires in-field inspections in order to identify and verify their locations for inclusion on mapping. It is possible that some sink hole identifications can be made through known high accuracy elevation data coupled with aerial photography, however to be thorough field inspections by knowledgeable staff is required. It is possible for the County Board to require staff to proceed with identifying and mapping sinkholes throughout the county and request that staff investigate possible cost-sharing programs through NR 151 or ATCP 50 to conduct that work. In addition to locating and mapping surface karst features like sinkholes, a better understanding of local groundwater flow in underground karst systems within the county is needed. That information is necessary for developing a county-wide groundwater recharge map, which can then be used to help identify future area of possible contamination of groundwater and private wells.

Last Paragraph: Second Sentence (typo)

The study recognized the occurrence and function of karst as the foremost data neededed

Last Sentence:

This study and further studies of karst and bedrock fracture can better inform the USGS Groundwater Flow Model, described in more detail in following paragraphs. This information will also provide important information in developing a county recharge map, should the County Board direct staff to do so. The WGHS study can be found here:

Page 7: Third Paragraph:

The model can be used to answer questions about transport (e.g., source of contaminated water), which will depend on flow directions and pumping rate. It can also be used to address site specific questions (where will the contaminant go and when will it arrive?), which will depend on flow direction, velocity, degree of karst, and the contaminant. The quality of the answers depends on scale, available data, tools, required level of precision (safety factor), and type of precision of question.

Main Findings: 2nd bullet - this listing of conduits should be in order of most likely to least likely:

- * A key concern for controlling groundwater contamination is the need to know about and how to manage major conduits from the surface to the groundwater source. To the best of our knowledge, conduits are primarily from, in order of most significant and likely sources: 1) fractures in karst areas; 2) sinkholes; 3) closed depressions (? - e.g.); and 4) improperly constructed or failing wells.

Third bullet:

- * Little is known about local groundwater flow in karst areas within St. Croix County. However, Kewaunee County, which has similar karst formations, has extensive research on this issue and they shared that research with this group. Kewaunee found that areas of karst structuring are particularly vulnerable to groundwater contamination because of their specific “Swiss cheese” type characteristics that allow for underground water to flow for miles.

Sixth bullet: Typo

- * The quality of the modeling answers depends on scale, available data, (**remove “and”**) tools, required level of precision (safety factor), and type of precision of question.

Page 8: Part 2: Regulation and management of surface and groundwater: First Paragraph:

As stated in the Wisconsin Constitution, Article 1, Declaration of Rights:

Equality; inherent rights. SECTION 1. All people are born equally free and independent, and have certain inherent rights; among these are life, liberty and the pursuit of happiness; to secure these rights, governments are instituted, deriving their just powers from the consent of the governed.

The St. Croix County Board is elected by the citizens of each district to represent and uphold the rights of all citizens. The County’s Vision statement is as follows:

Be a model of service in the State for effective, sustainable governance, vibrant economy, and quality rural and urban life.

In order to achieve that Vision, the Counties Mission is as follows:

St. Croix County government provides services that promote the safety, health and welfare of our citizens and other public, through cooperation and innovation, in a fiscally responsible and accessible manner.

Regulation and management of surface and groundwater must include a citizen's right to safe, clean drinking water. The current regulatory situation in the State of Wisconsin has ignored individual citizen rights and severely limits what local governing units, as in this case, St. Croix County, from being able to adequately represent "the governed", also known as individual citizens. The tools that are currently available to the county without risk of threats of state lawsuits include:

- * **Quality standards** - Sets standards for maximum contamination levels for specific contaminants for water resources. There are specific quality standards for Drinking Water. Minimum standards are typically set by the Federal Government and adopted by the State. Local governments can petition to have additional quality standards added, however the State requires extensive study and scientific data, which local governing units may not be able to provide due to staff and financial constraints. Consequently, groundwater continues to be contaminated for months and even years before enough data can be obtained to meet this high level of proof.
- * **Performance standards** - The State sets standards guiding how the quality standards will be achieved and local governing units have no choice but to adopt.
- * **Technical standards** - The State, through specific state agencies, sets standards for how the performance standards will be achieved. Again, local governing units have no choice but to adopt. However, through extensive study and proof of a situation where public health and safety is not being protected, the local governing unit can request the state to allow the local governing unit to exceed the state adopt levels. We can again look to the level that was required by Kewaunee County, where years of extensive study and proof and about 1/3rd of their private wells are contaminated and determined to be unfit for human consumption, has resulted in significant cost to the County, its citizens (the governed) and resulting in only certain specific areas being held to a somewhat higher standard of protection.

Main Findings: First Bullet:

- * High burden of justification for exceeding State standards is currently on the shoulders of the citizens the state through their locally elected representatives who are charged with protecting the public's health on a local level.

Add Third Bullet:

- * County staff are currently in the process of update zoning ordinances. The Rural Residential District has issues due to its "catch-all" type wording and incompatible uses are sometimes causing friction between adjoining land uses. Specifically, the Conditional Use Permitting allowing for Large Livestock Facilities on Rural Residential properties is a point of friction in that district. "The Rural Residential District is intended to include areas which exclusive agricultural use on an area-wide basis is not warranted due to such factors as the existence of mixed uses prior to the date the district was

established and located, demonstrated or expected ability of farm and elected conform uses to exist in close proximity without undue conflict or determination that the area is in a state of transition to urban residential character.” The Conditional Use Permit allowing for Large Livestock Facilities is inconsistent with the overall purpose of the zoning district resulting in conflicts.

Page 11: Add Bullet:

* The County continues to experience an increasing number of private well contamination in rural communities.

Page 13: 4th Paragraph: The chart seems to indicate most of the population growth in the County is in urban areas? Our focus should be rural being is we are specifically charged with examining possible sources of pollution in the rural area, e.g. “Large Animal Facilities”. These 2 statements are inconsistent:

There are approximately 15,300 Private Onsite Wastewater Treatment Systems in St Croix County.

Total Number of Systems Constructed or Replaced Exceeds 15,300 in St. Croix County

Page 15: Second Paragraph: Third Sentence:

Add “Municipal Treated” septage can be land spread at pre-approved sites. (If this is not correct then further explanation of why septage haulers are allowed to pump a system and directly spread on land.

Fourth Line:

“When sited properly, land application of septage can recycle nutrients, reduce fertilizer needs and improve soil health.” - **Please cite the scientific data and studies where this is concluded. Also, how do we know this isn’t part of the problem with wells being contaminated with e-coli and other contaminants? We don’t from our study group’s work.**

Page 18: Part 6 Nutrient Management Plans. First Paragraph:

A Nutrient Management Plan (NMP) is a strategy for obtaining the maximum return from on- and off-farm fertilizer resources in a manner that hopes to protect the quality of nearby water resources. **(This study group has not determined that the science shows NMPs accomplish this overall goal. They may help but do they definitively “protect”? WE just don’t know but we do know what Kewaunee County has told us).**

Add: Lee Luft, Kewaunee County Board Supervisor, pointed out in his presentation on the study findings in Kewaunee County that, while Kewaunee County has the highest participation rate for NMPs state-wide (about 80%), it also has the worst documented water quality in the state (wells contaminated at 30-60%).

Throughout this section, the word “farm” is used. With regard to requiring NMPs only those “farms” that are in Farmland Preservation are “required” to do NMPs. The words “Large Livestock Facilities” should be inserted wherever this requirement is talked about along with “Farms of less than 500

animal units that participate in Farmland Preservation. The way this is written is very confusing - implies "All Farms" are required to do NMPs and they are not.

Page 19: Third Paragraph, First Sentence (Typo & error):

All Large Livestock Facilities (All farms are not required) are required to have "a" not "an" NMP

Add: Farms with less than 500 animal units are also required to have a NMP if they participate in the Farmland Preservation Program, a property tax reduction program.

Page 30: Advocate State & Federal Level: Objective 3.2 State: Recommendations to begin implementing in the long-term (3-5 years): First Recommendations:

Advocate for laws and rule changes requiring the county to receive SnapPlus files from consultants.

Third Recommendation:

Lobby state to raise standards for POWT construction (e.g., allowing for denitrification technologies).

Cooperate Locally: Objective 4.1 Outreach: Recommendations to begin implementing in the long-term (3-5 years): Second Recommendations: Third Line (Typo):

"...pollutant sources, contamination levels..." **(remove second comma after sources)**

Fourth Line: What does "getting ready for POWTs" mean?

Page 25 Main Findings: Add Bullet:

* Other Wisconsin counties (Bayfield, Kewaunee, Manitowoc) as well as communities like the Town of Saratoga, have adopted livestock operations (not siting) and groundwater protection ordinances under state public health and police power authority.

Page 31 Objective 4.2 Develop Communities: Recommendations to begin implementing in the short-term (0-2 years): First Recommendation: Add "County Board" to the column on the right. Also, reword:

Re-establish standing committee on Land and Water Conservation, ensure the committee's charge is to specific language to ensure protection of land and water resources are continuing to be high priorities for the County Board and staff. This may require a review by the County Board of the Community Development Committee rules and by-laws established by the County Board and to clarify delineation of responsibility between CDD and the Department of Health and Safety.

Objective .2 Explore Alternative Solutions: Recommendation to begin implementing in the long-term (3-5 years): Third Recommendation:

Partner with cities, villages, and townships in developing Total Maximum Daily Load (TMDL) Adaptive Management Plans.