POLICY PROPOSAL

Reduce human exposure to well water nitrate in two La Crosse County townships.

La Crosse County Health Department developed a local task force to identify root causes of nitrate contamination in private wells located in the Towns of Holland and Onalaska. The task force evaluated and selected public policy recommendations to reduce human exposure to nitrate in drinking water. Laboratory testing conducted in 2017 indicated a significant number of the 10,000 residents were using drinking water above state and federal nitrate standards.

Defining the Problem

Main Policy Question:

How can La Crosse County Health Department and others reduce the number of residents exposed to well water exceeding the nitrate health standard?

Problem Trajectory – Agricultural Sources of Nitrogen

Background:

In July 2016, La Crosse County Health Department staff reviewed the Wisconsin Legislative Audit Bureau report "Wastewater Permitting and Enforcement" which evaluated the Wisconsin Pollutant Discharge Elimination System (WPDES) program administered by the Wisconsin Department of Natural Resources (WDNR). The audit found circumstances where WDNR did not adequately monitor pollution data and did not take enforcement actions to protect surface and ground waters. One violation mentioned in the audit report concerned a Concentrated Animal Feeding Operation (CAFO) located in La Crosse County near Holmen, WI. The majority of the CAFO's groundwater monitoring well samples collected between 2005 and 2016 exceeded the drinking the water standard for nitrate-nitrogen (10mg/L). After reviewing monitor well data, La Crosse County Health Department sent Health Advisory letters to all residents in the Towns of Holland and Onalaska recommending immediate well water testing for nitrate and coliform bacteria. By the June 2017, more than 540 wells were tested by La Crosse County Health Laboratory. Thirty percent (30%) of these wells exceeded the federal nitrate standard of 10 mg/L nitrate-nitrogen and 60% were 5.0 mg/L or greater indicating widespread groundwater pollution from human activities. A statewide survey of agricultural chemicals in Wisconsin groundwater conducted between March and August 2016 estimated 8.2 % of wells were above 10 mg/L.

Nitrate is a public health concern because of the potential harmful effects of exposure in contaminated drinking water. The illness methemoglobinemia occurs when infants ingest excessive nitrate. Also known as "Blue Baby Syndrome", excess nitrate interferes with the oxygen-carrying capacity of the blood creating an oxygen deficiency which can be fatal. The federal drinking water standard of 10 mg/L of nitrate-nitrogen was established in 1977 because of this condition. Although all health effects of chronic nitrate exposure are not well understood, epidemiological studies have identified an association between consumption of water with high nitrate levels and other adverse human health outcomes

including problems with thyroid function, diabetes, and birth defects among children of mothers exposed during pregnancy.

Agriculture and Nitrate:

The Towns of Holland and Onalaska are home to 9,436 residents and contain 16,000 acres of agricultural land. Groundwater is the sole source of drinking water and most private wells obtain water from an unconfined shallow sand-and-gravel aquifer which is 10-20 feet below the surface and 200 feet thick. Groundwater moves through the aquifer at three feet per day in a southwest direction toward the Mississippi River. The sand-and-gravel aquifer is more permeable than the underlying sandstone aquifer. The permeable soil and shallow aquifer conditions increase groundwater vulnerability to contamination from manure, fertilizers and private septic systems. Contaminants infiltrate the groundwater where they move quickly through the permeable substrate material and enter drinking water wells. Municipal sewer and water service is not currently available to these residents. More than 94% of the wells tested by LCHD were less than 150 feet deep. Figure 1.

Satellite imaging shows significant cropland acreage in both townships. The Bureau of Agrichemical Management of the Wisconsin Department of Agriculture & Consumer Protection reported 856,000 tons of nitrogen fertilizers were used by Wisconsin farmers from July 2015 to June 2016. Plants use nitrogen most efficiently when the producer applies it as close as possible to the time of crop uptake. Good nitrogen management involves supplying the right amount at the right time for crop needs. Lack of sufficient nitrogen reduces crop yields, but any nitrogen in excess is subject to leaching to groundwater. Studies show even small amounts of over-fertilization increased nitrate levels above drinking water standards.

In Wisconsin, 90% of the groundwater nitrate contamination is estimated to have originated from agriculture, 9% from septic systems, and 1% from other sources. In 2016 the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) and the Wisconsin Field Office of the National Agricultural Statistics Service (NASS) conducted a survey of agricultural chemicals in Wisconsin groundwater. Four hundred private drinking water wells were selected for testing using a random sampling procedure. Samples were analyzed for 101 different compounds, including herbicides, herbicide metabolites, insecticides, fungicides, and nitrate-nitrogen. Eight percent (8%) of the wells exceeded the nitrate-nitrogen standard of 10 mg/L.

Wisconsin Act 27 was created in 1997 to respond to growing public concern over water pollution from farm runoff and provided the framework for regulation of animal waste from livestock operations. The La Crosse County Department of Land Conservation is charged with the responsibility of protecting and enhancing the soil and water resources of the County. There are 170,000 acres of farmland in the La Crosse County, most of which is cropped for feeding dairy cattle or for cash grain. A County zoning ordinance regulates farms with 200 or more animal units through a permitting process. The County uses Wisconsin Chapter ATCP 51 Livestock Facility Siting regulations to review farming operations along with the Animal Waste Management Ordinance adopted in 1998. The ordinance regulates the construction and operation of animal feedlots and manure storage facilities and enforces Wisconsin Chapter NR 151 Runoff Management. County staff also provide nutrient management planning assistance to farmers seeking compliance with conservation standards. The goal is to provide the correct amount of nutrient needed by crops and limit the amount of nitrogen lost to groundwater and runoff.

Concentrated Animal Feeding Operations (CAFOs) are agricultural meat, dairy, or egg facilities where animals are kept and raised in confined conditions. In Wisconsin, CAFOs are defined as farms with at least 1000 animal units. Because the animals do not graze or seek feed in pastures, large volumes of manure and urine accumulate in small areas posing significant challenges to environmental protection. CAFOs must provide at least six months of manure storage capacity which is accomplished through construction of holding tanks, collection basins or lagoons. Animal waste is spread on lands near the CAFO where it is used to fertilize crops. The cropland must be in close proximity to the CAFO to make manure disposal economically feasible. Land spreading manure may impact surface and groundwater and increases the risk of private well water contamination.

There is one CAFO located within the Town of Onalaska. Babcock Genetics Inc. operates a swine CAFO that finishes 7,000 pigs annually. Fecal matter is moved daily into deep pit collection basins and collection pits. Manure is then sent to a 2-stage lagoon where it is eventually irrigated on adjacent lands during the spring and summer months. Manure application rates are determined by the manure nutrient content, soil nutrient level and the type of crop grown. Land spreading is done in accordance with Babcock Genetics' nutrient management plan and is regulated by the WDNR through the WPDES program. Babcock Genetics' 2017 annual report stated 10,000,000 gallons of liquid swine manure was spread over 327 acres on Dummer Family Farms from June-August 2017.

There were six groundwater monitoring wells located at Babcock Genetics and each was sampled three times during 2017 for a total of 18 samples. Nitrate levels ranged between 2.81 - 38.1 mg/L with 14 of the 18 samples exceeding 10 mg/L. This is similar to the data collected from the same monitoring wells between 2010 and 2016. The monitoring wells are shallow and vary from 21.04 to 30.93 feet in depth to groundwater. The monitoring wells are positioned to collect groundwater as it enters the CAFO and as it leaves the property to determine the impact of the operation. Not all CAFOs are required to conduct groundwater monitoring. The monitoring well data suggests Babcock Genetics has an impact on groundwater but to what extent remains unknown. It is reasonable to assume the spreading of millions of gallons of swine manure on nearby croplands with permeable soil characteristics must impact the amount of nitrate leaching to the aquifer. WDNR officials have made it abundantly clear that current Wisconsin laws are not intended to hold agricultural operations to the nitrate drinking water standard. NR 151 "Runoff Management" states the following;

"NR 151.004 State targeted performance standards. Implementation of the statewide performance standards and prohibitions in this chapter may not be sufficient to achieve water quality standards under chs. NR 102 to 105 or groundwater standards under ch. NR 140."

Wisconsin Chapter NR 140 establishes groundwater quality standards for substances of public health concern including nitrate.

Problem Trajectory – Private Septic Systems

La Crosse County Health Department estimates there are 3,000 private septic systems within the two townships. The primary concern regarding wastewater systems is the effect they have on nitrate levels in groundwater. Conventional systems are not designed to remove much nitrate or any other chemical from wastewater. Nitrate concentrations in groundwater usually exceed the drinking water standard of

10 mg/L near septic drainfields. A high density of septic systems is more likely to cause local groundwater contamination than a single system. Studies have shown effluent can remain a distinct plume for as much as several hundred feet. If not properly located or maintained, on-site sewage systems can significantly pollute groundwater in nearby wells. Some community members in Holland expressed concerned that sandy soil conditions existing throughout the town may predispose the town to increased occurrences of groundwater pollution.

An average-sized household using a septic system generates about 25 pounds of nitrogen annually. For all onsite septic systems nationally, this amounts to about 260,000 tons of nitrogen released per year. By comparison, chemical fertilizers amount to more than 12,000,000 tons of nitrogen. Nitrogen removal in wastewater varies depending on the type of waste, concentration, and type of system used to treat it. About 75-90% of nitrogen in household wastewater comes from toilet wastes and approximately 90% of that is from urine. Nitrogen concentrations generally range 50-60 mg/L in domestic wastewater. Some nitrogen entering the septic tank is removed when the scum and solids are pumped from the tank during routine maintenance. The concentration of total nitrogen in septic tank effluent is quite variable, ranging from 20-200 mg/L. Studies of groundwater below septic drainfields found 10-25 percent of nitrogen was removed from wastewater.

Processes for reducing nitrogen concentrations in discharges of treated sewage from large centralized wastewater treatment plants are well developed. The processes used at larger facilities are not practical for use in private onsite septic systems serving individual residences. Existing technologies for private onsite treatment to remove nitrate can be grouped into four main categories; (1) biological nitrification and denitrification, (2) source separation of urine, (3) physical/chemical removal, and (4) removal by natural systems such as constructed wetlands.

Currently, about half of the states regulate nitrogen from private onsite septic systems. In states that regulate nitrogen from single-family homes, regulations typically apply only to those located in certain regions with groundwater problems or those near nitrogen-sensitive bodies of water. For example, in Massachusetts the Department of Environmental Protection has designated “nitrogen-sensitive areas” in which new nitrogen discharges must be limited. Designation of these areas is based on ecological sensitivity and relative risk of threats to drinking water wells. Nitrogen treatment technology will add $10,000- 20,000 to the cost of a private septic system.

In Wisconsin, private systems are regulated through Chapter SPS 383 “Private Onsite Wastewater Treatment Systems.” The administrative rule exempts private septic systems from meeting groundwater standards for drinking water. However, SPS 383(5) does not limit municipalities from establishing nitrate standards in local zoning ordinances.

“SPS 383(4). GROUNDWATER STANDARDS. (a) Pursuant to s. 160.255, Stats., the design, installation, use or maintenance of a POWTS is not required to comply with the nitrate standard specified in ch. NR 140 Table 1, except as provided under sub. (5).

SPS 383(5). LOCAL ORDINANCES. (a) Pursuant to ss. 59.70 (5) (a), 145.02 (2) and 145.13, Stats., this chapter is uniform in application and a governmental unit may not enact an ordinance for the design, installation, inspection and management of a POWTS which is more or less stringent than this chapter, except as specifically permitted by rule. (b) Except as provided in s. SPS 383.25 (1) (b), a governmental unit shall submit to the department any proposed ordinance or proposed ordinance revision relating to

POWTS. The proposed ordinance or revision shall be submitted for review a minimum of 30 calendar days prior to the first scheduled public hearing date regarding the ordinance. Note: Pursuant to ss. 59.69, 60.62, 61.35 and 62.23, Stats., this chapter does not affect municipal authority for zoning, including establishing nitrate standards as part of a zoning ordinance to encourage the protection of groundwater resources."

The planning of rural subdivisions with large on-site systems or clusters of on-site systems should include an evaluation of drinking water wells to ensure they are protected from sources of contamination. If the evaluation finds a risk, alternatives such as protected water supplies (i.e. mandatory well location and depth), nitrogen-reducing private septic systems, or community water supply and wastewater treatment should be explored.

Public health and environmental risks from properly sited, designed, constructed, and operated septic tank systems appear to be low. However, soils with excessive permeability, low organic matter, low pH, and high moisture content can increase health and environmental risks under certain circumstances.

Policy Options

La Crosse County Health Department developed and organized a task force made up of township citizens and key County Departments from Public Health, Land Conservation, UW- Extension, and Planning to address the nitrate problem. The Nitrate Well Water Task Force (NWWTF) met monthly from December 2017 to June 2018 and was charged with developing public policy directed at reducing human exposure to nitrate in drinking water wells in the Towns of Holland and Onalaska. The NWWTF met with experts from agriculture, USGS, and municipal public works to study the issue and develop strategies. A comprehensive literature review was conducted to determine how others were handling nitrate problems across the country. A list of potential public policies was developed. Table 1.

Policy Recommendations

The Nitrate Well Water Task Force met on June 6, 2018 and reviewed the policies in Table 1. The NWWTF recommended the following public policies be implemented to reduce human exposure to nitrate in private well water;

1. Develop processes to inform current and potential residents of the nitrate contamination hazard through realtors, builders, county and municipal governments.
2. Extend municipal water systems from the Village of Holmen and City of Onalaska to existing residential developments where cost effective.
3. Allow new residential developments in the Towns of Holland and Onalaska in areas where homes can be connected to public water systems or protected community wells.
4. Rent or purchase lands currently used for row crops and replace with green spaces or land used for recreation.
5. Require green zones in all new subdivisions to protect wells. Green zones are areas with vegetation where no chemicals, manure or other substances are added to the landscape.

Summary

A significant number of La Crosse County residents are exposed daily to harmful contaminants in their drinking water. Nitrate is the most common contaminant and exists as an unfortunate legacy of past land use and weak attempts to protect groundwater. It will be many decades before groundwater nitrate decreases to safe levels even if all sources were brought under control today. The use of point-of-use treatment devices such as reverse osmosis filtration require constant vigilance and maintenance by the homeowner. New wells continue to be drilled into the same shallow contaminated aquifer exposing new unsuspecting residents to this hazard.

While these challenges seem daunting there are solutions. Reducing the number of people dependent on private wells through utilization of public water utilities, protected deep community wells and zoning regulation offers the opportunity to consume safe water. Local residents, developers, well drillers, farmers and their governments must work together to make it happen. Much more can be done to reduce sources of nitrate through better land use, improved agricultural practices, new septic system technologies, effective environmental regulations and educational strategies to keep the public informed.

Figure 1.

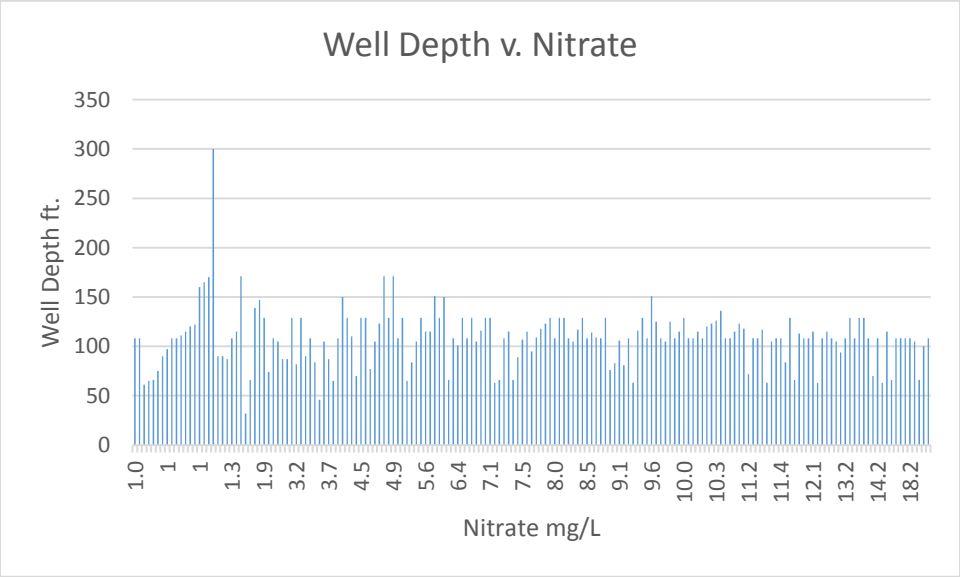

Table 1.

County Government

Use planning and zoning methods to limit residential growth in the Towns of Holland and Onalaska to areas where homes can be connected to public water supplies.

Implement a process to inform potential residents of the nitrate contamination hazard through realtors, builders, county and municipal governments.

Implement an ordinance requiring nitrate reduction treatment devices on all new septic systems installed in high nitrate areas.

Recommend implementation of a fertilizer excise fee to provide incentive to use less.

Designate areas and develop GIS mapping where groundwater resources are at high risk of contamination.

Develop and implement a process to share WPDES compliance information between the WDNR and La Crosse County Health Department.

Seek to revise Wis. Stat. 93.90 to allow local governments to impose more stringent conditions on livestock siting permits to protect groundwater.

Seek to revise WI Administrative Codes ATCP 51 Livestock Facility Siting, NR 243 Animal Feeding Operations and NR 151 Runoff Management to prevent land spreading manure in groundwater sensitive areas.

Seek to revise Administrative Code SPS 383 to allow state regulation of nitrate in private septic system effluent.

Conduct studies in residential areas to determine if nitrate is human or agricultural in origin by testing a series of private wells for artificial sweeteners and alachlor metabolites.

Require periodic nitrate testing of private wells.

Establish a drinking water well monitoring program using homeowner volunteers to determine if nitrate concentrations are increasing or decreasing.

Township and Municipal Governments

Extend water service from Holmen and Onalaska to existing residential developments when cost effective.

Limit residential growth in the Towns of Holland and Onalaska to areas where homes can be connected to public water systems.

Prohibit land spreading of human wastes in groundwater sensitive areas.

State Government

Require nitrate reduction treatment on all new septic systems installed groundwater sensitive areas.

Revise WI Stat. 93.90 to allow local governments to impose more stringent conditions on livestock siting permits to protect groundwater.

Revise WI Administrative Codes ATCP 51 Livestock Facility Siting, NR 243 Animal Feeding Operations and NR 151 Runoff Management to prevent land spreading manure in groundwater sensitive areas.

Revise WI Administrative Code ATCP Chapter 50 to update NRCS 590 standard so farmers may continue participation in the nutrient management program.

Revise Administrative Code SPS 383 to allow regulation of nitrate concentration from private septic system effluent.

Implement a fertilizer excise fee to provide incentive to use less.

Develop and implement a process to share WPDES compliance information between the DNR and La Crosse County Health Department.

Others

Rent or purchase lands currently used for row crops and replace with recreational uses.

Provide financial incentives to change from row crops to crops requiring less nitrogen fertilizers.

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