Ordinance 11-30-16 Town of Saratoga
Livestock Operation Ordinance

SECTION 1: INTRODUCTION

1.1 Title. This Ordinance shall be referred to as the Livestock Operation Ordinance.

1.2 Authority. This Ordinance is adopted pursuant to the authority granted in Wis. Stat. §§ 60.10, 60.22, 61.34, 92.11, and 92.15.

1.3 Findings of Fact and Declaration of Policy. The Town of Saratoga makes the following findings and declarations in support of this Ordinance:

(1) The Town recognizes the importance of protecting groundwater quality, and that proper land use and management, including proper management of nutrients from livestock operations, is essential to the protection of groundwater quality, public health, safety and welfare, and the property tax base of the Town. The Town's 5,385 residents rely on private wells for their drinking water.

(2) Land application of animal wastes can significantly impact groundwater quality by increasing the level of nitrates and increasing the risk of pathogens and other contaminants, particularly in environmentally vulnerable areas.

(3) Nitrates and other contaminants present significant environmental and public health risks. Scientific research shows that elevated concentrations of nitrate in drinking water has been associated with the risk of methemoglobinemia, or "blue baby syndrome," in humans. Contaminated groundwater directly threatens the health of Town residents, who rely on private wells for their water supply.

(4) The Town lies in an area that is recognized by scientists as being particularly susceptible to nonpoint source pollution of its groundwater due to sandy and highly leachable soils. Sandy soils are prone to leaching because they allow water—and any contaminants in the water, such as nitrate—to quickly pass through them.

(5) The U.S. Geological Survey has classified Wisconsin soils, and has determined that the sandy soils present in the Central Sands, in which the Town is located, are among the most susceptible to groundwater contamination. (Attachment A) The Natural Resource Conservation Services (NRCS) has also classified soil types based upon, among other things, the permeability of the soil and how quickly water infiltrates the soil.

Nearly all of the soil in the Town is categorized as among the poorest in terms of permeability and thus leaching potential due to the ability of water to rapidly pass through the soil. (See http://websoilsurvey.nrcs.usda.gov). Under the NRCS soil classification system, the predominant soil type in the Town is classified as Plainfield Series soil, and other types include soil in the Friendship and Meehan series categories. The NRCS characterizes the permeability of all of

these soil types as rapid or very rapid, which exacerbates the potential for leaching of contaminants into the Town's groundwater.

(6) Crops take up nitrate in varying amounts, depending on the crop, but can only do so if the nitrate remains in the root zone during relatively brief periods during the growing season. Water, whether in the form of rain or irrigation, will drive nitrates down below the root zone, sometimes in a matter of hours if sufficient water is applied to the soil. The problem is exacerbated by the need to irrigate because the sandy soil is poor at retaining water. And research has shown that the conditions in the Central Sands region result in even more rapid movement of water than is typically seen in sandy soils generally. Kung, K J S, *Preferential Flow in a Sandy Vadose Zone: 2. Mechanism and Implications,* Geoderma 46 (1-3): 59–71. doi:10.1016/0016-7061(90)90007-V (1990); Kung, K J S, *Preferential Flow in a Sandy Vadose Zone: 1. Field Observation*, Geoderma 46 (1): 51–58. doi:10.1016/0016-7061(90)90006-U (1990); Kung, K J S, *Laboratory Observation of Funnel Flow Mechanism and Its Influence on Solute Transport,* Journal of Environment Quality 22 (1): 91. doi:10.2134/jeq1993.00472425002200010012x (1993).

(7) Because of the susceptibility of sandy soils to leaching, nutrient management techniques that might otherwise succeed in preventing groundwater contamination in more favorable soils are not effective in areas like the Central Sands. This fact has been extensively documented in longstanding scientific research. For example, in 1989 scientists studying the conditions leading to groundwater contamination from agriculture in the Midwest offered the Central Sands of Wisconsin as a case study. They concluded that "...the Central Sand Plains situation combines virtually every factor for adverse groundwater impact; i.e., soils with high hydraulic conductivities, very shallow aquifers, level terrain, substantial precipitation, and crops with high moisture and fertilizer requirements. . . ." Mossbarger, W A, and Yost, R W, *Effects of Irrigated Agriculture on Groundwater Quality in Corn Belt and Lake States,* Journal of Irrigation and Drainage Engineering 115 (5): 773–90 (1989).

(8) Subsequent research has repeatedly confirmed the original conclusion that the soils in the Central Sands are highly susceptible to groundwater contamination. A 2001 analysis of a nationwide dataset from United States Geological Survey (USGS) National Water-Quality Assessment Program (1992-1995) identified predictors of a high likelihood of nitrate contamination. The resulting statistical model indicated that the presence of "well-drained" soils, such as the soils present in the Town, significantly increased the probability of dangerous nitrate levels in groundwater. Nolan, Bernard T., *Relating Nitrogen Sources and Aquifer Susceptibility to Nitrate in Shallow Ground Waters of the United States*, Ground Water 39: 290–99 (2001).

In 2002, other researchers sought to identify the key factors leading to nitrate contamination of groundwater, by examining the importance of crop type, presence of irrigation, soil permeability, and the nature of the aquifer. The situation most susceptible to nitrate contamination was irrigated, highly permeable soils, overlying an unconsolidated aquifer – precisely the situation in the Town. Burkart, M R, and Stoner, J D, *Nitrate in Aquifers Beneath Agricultural Systems*, Water Science & Technology 45 (9): 19–29 (2002).

(9) Research conducted specifically in the Central Sands area also confirms the high likelihood of nitrate contamination in the sandy soils present in the Town. A study of nitrate concentrations

and estimated loadings beneath irrigated sandy agricultural fields near Nekoosa, Wisconsin revealed nitrate contamination of groundwater, with concentrations above the safe level for human consumption. Stites, Will, and Kraft, George J, *Groundwater Quality Beneath Irrigated Vegetable Fields in a North-Central U.S. Sand Plain*, Journal of Environmental Quality 29 (January): 1509–17 (2000); Stites, W, and Kraft, G J, *Nitrate and Chloride Loading to Groundwater From an Irrigated North-Central U.S. Sand-Plain Vegetable Field*, Journal of Environmental Quality 30 (4), American Society of Agronomy, Crop Science Society of America, Soil Science Society: 1176–79. doi:10.2134/jeq2001.3041176x. (2001); Kraft, George J, and Stites, Will, *Nitrate Impacts on Groundwater From Irrigated-Vegetable Systems in a Humid North-Central US Sand Plain*, Agriculture, Ecosystems & Environment 100 (1): 63–74. doi:10.1016/S0167-8809(03)00172-5 (2003).

The groundwater at the nearby University of Wisconsin Hancock Agricultural Research Station in Waushara County has also been extensively studied, and testing there shows that the application of fertilizer to potatoes has resulted in levels of nitrates unsafe for human consumption. Bero, Nicholas J; Ruark, Matthew D, and Lowery, Birl, *Controlled-Release Fertilizer Effect on Potato and Groundwater Nitrogen in Sandy Soil*, Agronomy Journal 106 (2), The American Society of Agronomy, Inc.: 359–10. doi:10.2134/agronj2013.0331 (2014).

(10) The high likelihood for groundwater contamination in the Town from the application of nutrients is also confirmed by the experience at a nearby Concentrated Animal Feeding Operation, Central Sands Dairy, which is located only a few miles from the Town in Juneau County, Wisconsin. Central Sands is operating pursuant to a permit issued by the Wisconsin Department of Natural Resources. Despite this oversight and compliance, Central Sands' application of manure and fertilizer to its crop fields has resulted in substantial exceedances of the health standard for nitrates of 10 parts per million.

Central Sands has been operating four groundwater monitoring wells since December 2014. One of the wells currently has a nitrate level below the human health standard of 10 parts per million, but that well is nearing the enforcement standard with a level of 8 parts per million. The remaining wells show substantial exceedances, ranging as high as 48 parts per million. (Attachment B) In July 2015, one of the monitoring wells recorded a nitrate level of 77 parts per million, nearly eight times the health standard. (Attachment B)

In addition, in 2016 Central Sands began testing the water in three of its irrigation wells, all of which show substantial exceedances of the nitrate health standard. As of July 2016, the nitrate levels in the irrigation wells were 22, 30 and 33 parts per million, respectively. (Attachment B)

(11) A recent experience in the Town has also confirmed the high likelihood of nitrate contamination from agricultural practices in the Town's vulnerable sandy soil. A 160-acre parcel was converted from pine plantation to agricultural crops, and in a period of only about two and a half years, the nitrate level in a nearby Town monitoring well downgradient from the converted crop fields spiked from 2.5 parts per million to 12.6 parts per million as of September 2016. (Attachment C)

(12) Results from the Town's groundwater monitoring wells confirm that, with the exception of

the recently contaminated well described in the preceding paragraph, the groundwater in the Town is exceptionally clean, with nitrate levels as of September 2016 ranging from undetectable amounts to a high of 3.2 parts per million. (Attachment C)

(13) The Town has engaged experts in nutrient management and hydrogeology to evaluate the likely groundwater impacts of the proposed Golden Sands Dairy Concentrated Animal Feeding Operation. The conclusions of the Town's experts are consistent with the academic research and the observed nitrate levels in and near the Town in agricultural areas. The Town's experts have modeled the potential impacts of the Golden Sands operation, using Golden Sands' submissions to the DNR, and have concluded that within three to five years the nutrient applications proposed by Golden Sands would raise nitrate levels in residential wells downgradient from Golden Sands' crop fields above the human health standard.

(14) Given the vulnerable sandy soils and the characteristics of the aquifer beneath the Town, land use and management regulations beyond the performance standards, prohibitions, conservation practices and technical standards contained in Wis. Stat. § 281.16(3) and Wis. Adm. Code ch. NR 151 are necessary to achieve or maintain water quality standards under Wis. Stat. § 281.15.

1.4 Purpose. The purpose of this Ordinance is as follows:

(1) To provide for the administration and enforcement of standards necessary to preserve and protect the Town's groundwater resources.

(2) To promote the protection of public health, safety, and general welfare of the citizens of the Town by protecting and preventing contamination of groundwater quality in the Town by regulating local land use and land management practices that cause excessive nonpoint source water pollution due to the vulnerable soil and other natural features of the Town.

1.5 Interpretation. In their interpretation and application, the provisions of this Ordinance shall be held to be minimum requirements and shall be liberally construed in favor of the Town of Saratoga, and shall not be deemed a limitation or repeal of any other power granted by the Wisconsin Statutes.

1.6 Severability.

(1) Should any section, clause, provision, or portion of this Ordinance be adjudged to be unconstitutional or invalid, unlawful, or unenforceable by a final order of a court of competent jurisdiction, the remainder of the Ordinance shall remain in full force and effect.

(2) If any application of this Ordinance to a particular parcel of land is adjudged unconstitutional or invalid by a final order of a court of competent jurisdiction, such judgment shall not be applicable to any other parcel of land not specifically included in said judgment.

1.7 Effective Date. This Ordinance shall become effective the day after publication or posting as provided by Wis. Stat. § 60.80.

1.8 Definitions. Unless specifically defined herein, all terms in this Ordinance have the meaning provided for in Wis. Stat. chs. 92 and 281, and Wis. Admin. Code chs. ATCP 50, 51, and NR 151.

(1) "Manure" means excreta from livestock kept at a livestock facility and includes livestock bedding, water, soil, hair, feathers, and other debris that becomes intermingled with livestock excreta in normal manure handling operations.

(2) "Person" means an individual, corporation, partnership, cooperative association, limited liability company, trust, or other legal organization or entity.

(3) "Point of standards application" has the meaning set forth in Wis. Stat. § 160.01(5) and Wis. Admin. Code § NR 140.22.

(4) "Town" means the Town of Saratoga, Wisconsin.

SECTION 2: ADMINISTRATION

2.1 Town Powers. The Town may:

(1) Consult with the County public health department and other appropriate resources to obtain accurate public health data and expertise necessary to the administration of this Ordinance.

(2) Respond to elevated groundwater contaminant levels as provided in sec. 3.4.

(3) Refer a violation of this ordinance to the Town's legal counsel for legal action.

(4) Issue a citation for a violation of this ordinance.

(5) Use any other lawful means to enforce this Ordinance, or take any emergency or interim action necessary to prevent or mitigate imminent harm to public health or safety, or other actions authorized by law.

(6) Hear and decide appeals, through the Town's Board of Adjustment, where it is alleged there is an error in a Town decision.

2.2 Other Lawful Means of Enforcement. Nothing in this section may be construed to prevent the Town from using any other lawful means to enforce this Ordinance.

2.3 Administrative Duties. In the administration and enforcement of this Ordinance, the Town shall:

(1) Investigate complaints relating to compliance with this Ordinance.

(2) Keep an accurate record of all inspections made, and other official actions.

(3) Perform other duties as specified in this Ordinance.

2.4 Inspection Authority. The Town may make any inspections necessary under this Ordinance to protect public health and safety. Where the Town does not have permission to enter lands subject to this Ordinance for inspection purposes, entry shall be according to Wis. Stat. § 66.0119. Refusal to grant permission to enter lands affected by this Ordinance for inspection purposes pursuant to the requirements of s. 66.0119 shall be grounds for initiating an enforcement action.

SECTION 3: LAND APPLICATION OF MANURE.

3.1 NRCS 590. All land application of manure shall conform to the United States Department of Agriculture Natural Resources Conservation Service (NRCS) Standard 590.

3.2 Nutrient Management Plans. Where the land application of manure is a component of a nutrient management plan required under Wis. Adm. Code §§ NR 151.07 or NR 243.14, the land application shall conform to the nutrient management plan.

3.3 WPDES Permits. Where the land application of manure is regulated by a WPDES permit, the land application shall comply with all terms of the permit, including any additional restrictions DNR imposes pursuant to Wis. Adm. Code § NR 243.14(10), based upon DNR's determination that such restrictions are necessary to prevent exceedances of groundwater quality standards.

3.4 Procedures For Groundwater Standards Exceedances From Manure Application.

(1) The Town may require a person engaged in the land application of manure to file a report with the Town, by a deadline set by the Town, under either of the following circumstances:

> (a) A groundwater contaminant exceeds a water quality Preventive Action Limit established by Wis. Adm. Code § NR 140.10, Table 1, at a point of standards application; there is a reasonable basis to conclude that manure application up-gradient from the contamination has contributed to the contamination; and the concentration of the contaminant has increased more than 50% since the commencement of manure application; or
>
> (b) A groundwater contaminant exceeds a water quality Enforcement Standard established by Wis. Adm. Code § NR 140.10, Table 1, at a point of standards application; and there is a reasonable basis to conclude that manure application up-gradient from the contamination has contributed to the contamination.

(2) The report required under Section 3.4(1) shall include, at a minimum, the following along with any other information specified by the Town:

(a) If the person responsible for the manure application disputes that the manure application has caused or contributed to the increase in the contaminant level, the factual basis for this position;
(b) All testing results and other information regarding the level of the contaminant on the property where the manure application occurs as well as any off-site, down-gradient areas;
(c) Proposed steps to investigate the causes and extent of the contamination;
(d) Proposed steps to curtail the increase in the contaminant level, and to avoid exceedances of the enforcement standard for the pollutant;
(e) Proposed steps to remediate the contamination.

(3) In addition to or in lieu of requiring a report, when either of the circumstances specified in 3.4 (1) is present, the Town may also do one or more of the following:

(a) Take no action;
(b) Require the installation and sampling of groundwater monitoring wells;
(c) Require a change in an existing groundwater monitoring program, including increased monitoring;
(d) Require an investigation of the extent of groundwater contamination;
(e) Require a revision of the operational procedures associated with the land application;
(f) Require an alternate method of manure application or disposal;
(g) Require remedial action to renovate or restore groundwater quality; or
(h) Require remedial action to prevent or minimize the further discharge or release of the contaminant to groundwater.

(4) A person engaged in land application of manure shall provide copies to the Town of all groundwater testing results that the person provides to the DNR or other governmental entity.

(5) A person engaged in land application of manure shall notify the Town within two business days when they become aware of an exceedance of a groundwater enforcement standard under Wis. Adm. Code § NR 140.10, Table 1.

SECTION 4: VIOLATIONS, PENALTIES, AND APPEALS

4.1 Violations.

(1) It is unlawful for any person to violate Sections 3.1, 3.2 or 3.3 of this Ordinance, or to fail to submit a report or take a required action under Section 3.4.

(2) It is unlawful for any person to knowingly provide false information, make a false statement, or fail to provide or misrepresent any material fact to a Town agent, board, commission, department, employee, officer, or official acting in an official capacity under this Ordinance.

(3) It is unlawful for a person to disobey; fail, neglect, or refuse to comply with; or otherwise resist an order issued pursuant to this Ordinance.

(4) A separate offense is deemed committed on each day that a violation occurs or continues.

4.2 Penalties.

(1) This Ordinance may be enforced through civil forfeiture or through issuance of an injunction by the circuit court in an action initiated by the Town.

(2) A person will, upon conviction for a violation of this Ordinance, forfeit not less than $1000 no more than $5000 for each offense, together with the costs of prosecution for each violation, and may be ordered to take such action as is necessary to abate the offense within a specified time.

(3) In the event an offense is not abated as ordered, the Town may take such action as is necessary to abate the offense and the cost of such abatement will become a lien upon the person's property and may be collected in the same manner as other taxes.

4.3 Appeals. Any person aggrieved by a decision of the Town may seek review before the Board of Adjustment.

Section 5. EFFECTIVE DATE

(1) The Ordinance shall take upon passage by the Town Board of the Town of Saratoga and upon publication provided by law.

Adopted this 30th day of November, 2016.

Terry Rickaby
Chairman

Douglas Passineau
Supervisor

Patty Heeg
Supervisor

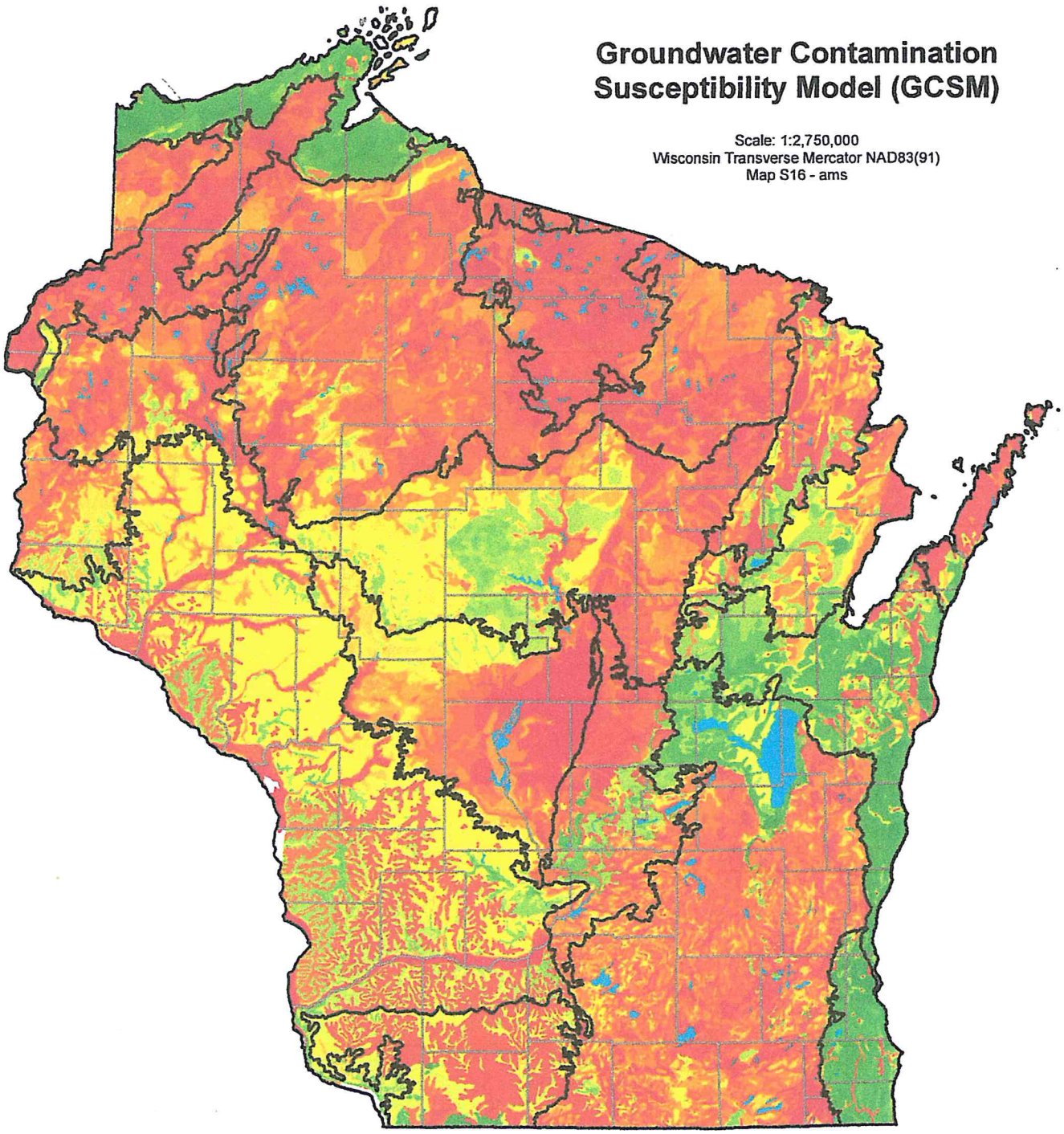
John Frank
Supervisor

Absent
Danny Forbes
Supervisor

Heidi Kawleski
Clerk

Groundwater Contamination Susceptibility Model (GCSM)

Scale: 1:2,750,000
Wisconsin Transverse Mercator NAD83(91)
Map S16 - ams



The Groundwater Contamination Susceptibility Model (GCSM) for Wisconsin estimates the susceptibility of the state's groundwater to contamination from surface activities. The GCSM was developed by the DNR, the US Geological Survey (USGS), the Wisconsin Geological & Natural History Survey (WGNHS), and the University of Wisconsin – Madison in the mid-1980s. The results of the GCSM are illustrated in a map published in 1987 at a scale of 1:1,000,000 (available from the Wisconsin Geological & Natural History Survey: http://www.uwex.edu/wgnhs/maps.htm).

GCSM Value
Low susceptibility
High susceptibility

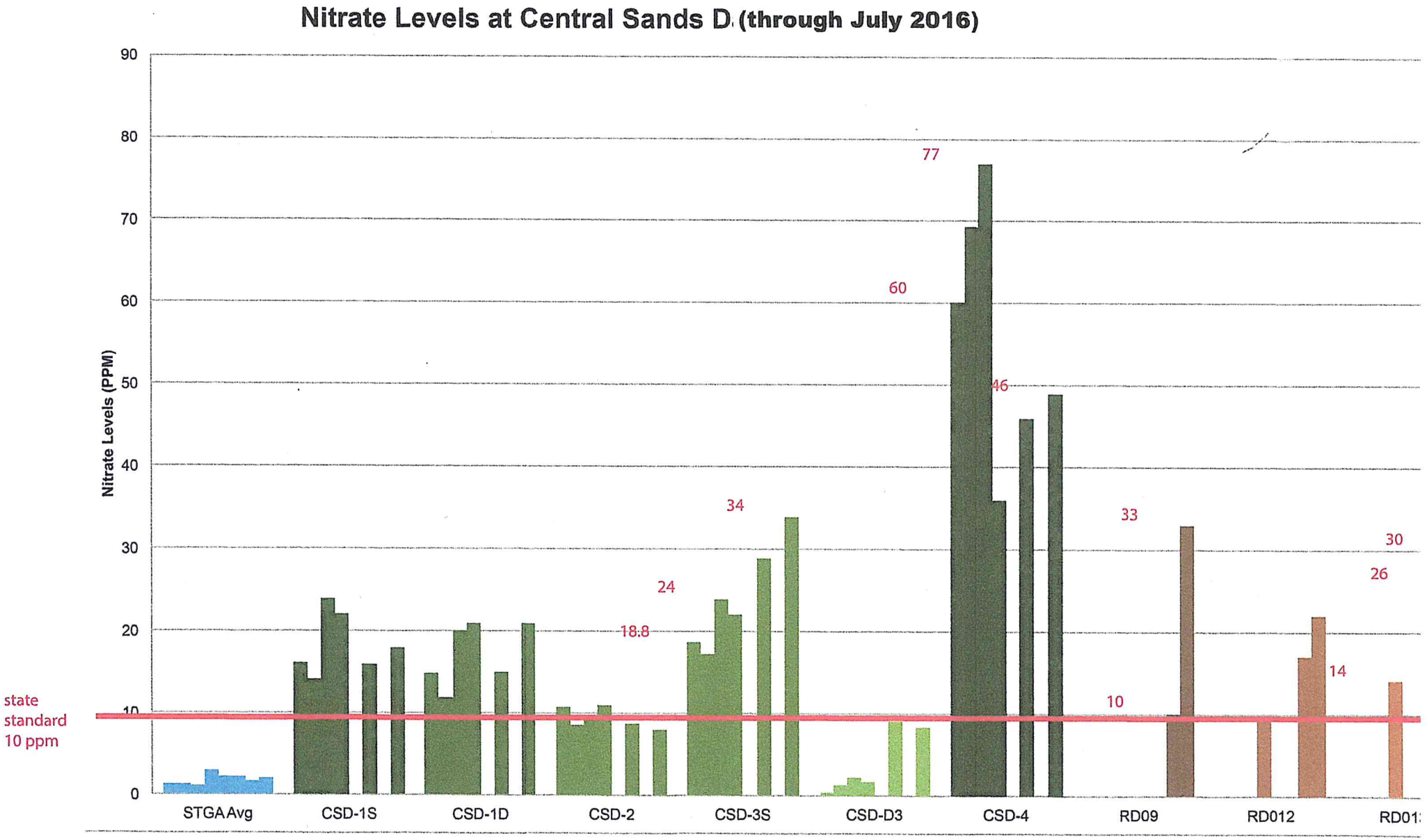
Ecological Landscape
County Boundaries
Open water - not susceptible

0 12.5 25 50 75 100
Miles

0 20 40 80 120 160
Kilometers

N
W E
S

Attachment A



Attachment B

QUARTERLY
GROUNDWATER MONITORING RESULTS
GOLDEN SANDS DAIRY
TOWN OF SARATOGA, WISCONSIN

Well Number	Date Sampled	Water Level Elevation (ft msl)	Depth to Water (ft bTOC)	Chloride (mg/L)	Nitrate + Nitrite, as N (mg/L)	E. Coli (MPN/100 ml)	Total Coliform (MPN/100 ml)	Total Phosphorous (mg/L)	Soluble Reactive Phosphorous (mg/L)
Drinking Water Standard		--	--	250[S]	10[P]	4/100 ml[P]	5%[P]	--	--
MW-U1	**12/17/2014**	1030.02	8.94	20.6	1.5	ND	>2419.6	3.3	
MW-U1	**3/19/2015**	1029.62	9.34	3.6	0.7	--	--	6.85	
MW-U1	**6/30/2015**	1030.46	8.50	7.6	1	--	--	2.54	
MW-U1	**9/23/2015**	1030.42	8.54	46	5.2	--	--	0.637	
MW-U1	**12/16/2015**	1030.79	8.17	7.6	1.8	ND	ND	6.22	
MW-U1	**3/30/2016**	1031.97	6.99	49.4	3.1	--	--	1.00	
MW-U1	**6/22/2016**	1031.02	7.94	128	0.5	--	--	0.416	ND
MW-U1	**9/14/2016**	1029.95	9.01	32.8	0.6	--	--	--	0.013
MW-U1									
PZ-U1	**12/17/2014**	1030.07	8.92	12.1	0.9	ND	10.9	0.262	
PZ-U1	**3/19/2015**	1029.68	9.31	ND	ND	--	--	0.044	
PZ-U1	**6/30/2015**	1030.53	8.46	ND	0.1	--	--	0.044	
PZ-U1	**9/23/2015**	1030.58	8.41	ND	ND	--	--	0.036	
PZ-U1	**12/16/2015**	1030.86	8.13	ND	ND	ND	ND	0.040	
PZ-U1	**3/30/2016**	1032.00	6.99	1.0	ND	--	--	0.084	
PZ-U1	**6/22/2016**	1031.08	7.91	0.7	0.1	--	--	0.010	0.016
PZ-U1	**9/14/2016**	1029.97	9.02	ND	ND	--	--	--	0.025
PZ-U1									
PZ-U1									
MW-D1	**12/17/2014**	1019.66	16.55	105	1	ND	>2419.6	3.77	
MW-D1	**3/19/2015**	1019.30	16.91	132	1.7	--	--	2.96	
MW-D1	**6/30/2015**	1019.77	16.44	68.4	1	--	--	2.03	
MW-D1	**9/23/2015**	1019.37	16.84	55.7	0.5	--	--	1.29	
MW-D1	**12/16/2015**	1019.22	16.99	14.3	0.2	ND	12	1.01	
MW-D1	**3/29/2016**	1021.09	15.12	24.4	0.3	--	--	3.78	
MW-D1	**6/22/2016**	1021.01	15.20	27.1	0.4	--	--	0.541	0.006
MW-D1	**9/14/2016**	1019.74	16.47	90.7	0.7	--	--	--	0.006
MW-D1									
MW-U2	**12/17/2014**	1023.58	12.96	9.3	0.1	ND	>2419.6	2.58	
MW-U2	**3/19/2015**	1023.31	13.23	4.1	ND	--	--	8.63	
MW-U2	**6/30/2015**	1023.87	12.67	10.7	ND	--	--	4.94	
MW-U2	**9/23/2015**	1023.79	12.75	9.7	ND	--	--	2.64	
MW-U2	**12/16/2015**	1023.78	12.76	27.6	0.3	ND	24.1	0.987	
MW-U2	**3/29/2016**	1025.92	10.62	9.5	ND	--	--	1.06	
MW-U2	**6/22/2016**	1024.95	11.59	4.7	0.4	--	--	0.975	0.013
MW-U2	**9/14/2016**	1023.43	13.11	5.9	ND	--	--	--	0.013
MW-U2									

Attachment C

QUARTERLY
GROUNDWATER MONITORING RESULTS
GOLDEN SANDS DAIRY
TOWN OF SARATOGA, WISCONSIN

Well Number	Date Sampled	Water Level Elevation (ft msl)	Depth to Water (ft bTOC)	Chloride (mg/L)	Nitrate + Nitrite, as N (mg/L)	E. Coli (MPN/100 ml)	Total Coliform (MPN/100 ml)	Total Phosphorous (mg/L)	Soluble Reactive Phosphorous (mg/L)
Drinking Water Standard		--	--	250[S]	10[P]	4/100 ml[P]	5%[P]	--	--
MW-U3	**12/17/2014**	1004.14	13.53	2.9	1.3	ND	>2419.6	1.5	
MW-U3	**3/19/2015**	1003.82	13.85	0.7	1.6	--	--	2.67	
MW-U3	**6/30/2015**	1004.56	13.11	1.7	1.5	--	--	1.39	
MW-U3	**9/23/2015**	1003.81	13.86	ND	2.7	--	--	0.488	
MW-U3	**12/16/2015**	1003.41	14.26	1.6	5.7	ND	2	0.356	
MW-U3	**3/29/2016**	1005.38	12.29	ND	1.3	--	--	0.852	
MW-U3	**6/22/2016**	1005.19	12.48	ND	1	--	--	0.266	ND
MW-U3	**9/14/2016**	1004.14	13.53	ND	0.7	--	--	--	ND
MW-U3									
MW-U4	**12/17/2014**	986.22	24.15	4.1	2.4	ND	5.2	3.21	
MW-U4	**3/19/2015**	985.76	24.61	0.5	1.7	--	--	2.1	
MW-U4	**6/30/2015**	986.16	24.21	8.9	1.7	--	--	1.03	
MW-U4	**9/23/2015**	985.85	24.52	13.8	3.9	--	--	0.416	
MW-U4	**12/16/2015**	985.53	24.84	9.9	3.5	ND	ND	0.27	
MW-U4	**3/29/2016**	986.50	23.87	25.8	6	--	--	0.34	
MW-U4	**6/22/2016**	987.42	22.95	51.9	6.2	--	--	0.722	ND
MW-U4	**9/14/2016**	986.51	23.86	29.9	12.6	--	--	--	ND
MW-U4									
MW-D2	**12/17/2014**	952.06	41.41	6.9	ND	ND	137.6	1.24	
MW-D2	**3/19/2015**	951.63	41.84	3	ND	--	--	2.32	
MW-D2	**6/30/2015**	951.72	41.75	31.6	0.3	--	--	0.403	
MW-D2	**9/23/2015**	951.83	41.64	38.7	ND	--	--	0.511	
MW-D2	**12/16/2015**	951.88	41.59	7.3	0.2	ND	1.0	0.198	
MW-D2	**3/29/2016**	952.40	41.07	16.5	0.2	--	--	0.616	
MW-D2	**6/22/2016**	952.71	40.76	5.4	ND	--	--	0.244	0.019
MW-D2	**9/14/2016**	970.07	23.40	10.8	ND	--	--	--	0.015
MW-D2									
MW-D3	**12/17/2014**	962.55	33.85	5.4	0.7	ND	>2419.6	1.47	
MW-D3	**3/19/2015**	961.93	34.47	ND	0.1	--	--	1.81	
MW-D3	**6/30/2015**	961.76	34.64	0.5	0.3	--	--	0.701	
MW-D3	**9/23/2015**	961.91	34.49	ND	ND	--	--	0.292	
MW-D3	**12/15/2015**	961.74	34.66	0.6	0.2	ND	79.4	0.412	
MW-D3	**3/29/2016**	962.02	34.38	ND	0.9	--	--	0.446	
MW-D3	**6/22/2016**	963.56	32.84	ND	0.8	--	--	0.20	0.013
MW-D3	**9/14/2016**	962.80	33.60	ND	2.8	--	--	--	0.019
MW-D3									

QUARTERLY
GROUNDWATER MONITORING RESULTS
GOLDEN SANDS DAIRY
TOWN OF SARATOGA, WISCONSIN

Well Number	Date Sampled	Water Level Elevation (ft msl)	Depth to Water (ft bTOC)	Chloride (mg/L)	Nitrate + Nitrite, as N (mg/L)	E. Coli (MPN/100 ml)	Total Coliform (MPN/100 ml)	Total Phosphorous (mg/L)	Soluble Reactive Phosphorous (mg/L)
Drinking Water Standard		--	--	250[S]	10[P]	4/100 ml[P]	5%[P]	--	--
MW-D4	**12/17/2014**	936.62	30.41	10.3	2.3	ND	18.9	0.847	
MW-D4	**3/19/2015**	936.24	30.79	3.5	2.4	--	--	2.04	
MW-D4	**6/30/2015**	936.30	30.73	2	2.6	--	--	0.268	
MW-D4	**9/23/2015**	936.33	30.70	2.7	2.7	--	--	0.362	
MW-D4	**12/15/2015**	936.34	30.69	2.1	3.1	ND	3.1	0.348	
MW-D4	**3/29/2016**	937.04	29.99	1.7	3.1	--	--	0.104	
MW-D4	**6/22/2016**	937.03	30.00	4.1	3.3	--	--	0.233	0.013
MW-D4	**9/14/2016**	936.59	30.44	5.8	3.2	--	--	--	0.008
MW-D4									
PZ-D1	**12/17/2014**	936.59	30.40	1.4	ND	ND	1	0.123	
PZ-D1	**3/19/2015**	936.23	30.76	ND	ND	--	--	0.055	
PZ-D1	**6/30/2015**	936.27	30.72	0.6	ND	--	--	0.036	
PZ-D1	**9/23/2015**	936.35	30.64	ND	ND	--	--	0.053	
PZ-D1	**12/15/2015**	936.31	30.68	1.0	ND	ND	ND	0.023	
PZ-D1	**3/29/2016**	937.03	29.96	ND	ND	--	--	0.023	
PZ-D1	**6/22/2016**	936.99	30.00	ND	0.3	--	--	0.037	0.019
PZ-D1	**9/14/2016**	936.48	30.51	ND	0.024	--	--	--	0.024
PZ-D1									

NOTES

-- : No data collected or no applicable Federal Primary or Secondary Standard has been established, as applicable.
S : Federal Secondary Drinking Water Standard.
* : Preventive Action Limit for Indicator Parameters.
ND : Constituent not detected above laboratory method detection limit.
P : Federal Primary Drinking Water Standard.
> : Constituent detected at a concentration greater than the laboratory maxium detection limit.
MPN/100 ml : Most probable number of coliform per 100 milliliters of sample
mg/L : Milligrams per Liter
ft bTOC : Feet below top of casing
ft msl : Feet mean sea level