Charles A. Morris, M.D., M.P.H.
266 Western Avenue
Sherborn, MA 01770

February 27, 2016

Ms. Daryl Beardsley, Chair
Board of Health
19 Washington Street
Sherborn, MA 01770

Re: Fields At Sherborn

Dear Chair Beardlsey and Board of Health Members:

My wife Tia Dennis and I have lived with our two children in Sherborn for ten years. We reside at 266 Western Ave, two lots away from the proposed Fields At Sherborn Development. I have followed the presentations at the open town meetings pertaining to this development with close attention. At some of these public discussions, the connection between the proposed development's septic system and its impact on public health—specifically, the health of current neighbors, and that of future development residents—has not been clearly presented. I would like to offer some observations from the perspective of a resident and physician.

I practice general adult medicine at the Brigham and Women's Hospital, where I also oversee a comprehensive population health program for thousands of patients with chronic disease. I hold a Masters Degree in Public Health from Harvard School of Public Health, and am an Assistant Professor of Medicine at Harvard Medical School. In light of this professional experience I believe I have a sound foundation with the concepts and health issues described below. Nevertheless, these reflect my own personal views and not those of my affiliated academic institutions or hospital.

Elevated nitrate and nitrogen levels pose risks for public health.

Nitrogen naturally occurs from decaying organic material, though is also added to the environment through fertilizers and septic systems. Ingested nitrates are converted to nitrite in the body, and nitrites are causally associated with methemoglobinemia, a rare and potentially fatal disorder in children less than 6

years of age; no cases have been reported in infants ingesting water with nitrate levels of < 10 mg/L. Nitrate contamination in drinking water has been associated with other health risks including a number of malignancies. [1,2] A recent study performed on Cape Cod, where contamination of wells from septic systems is well described, suggested increased breast cancer risk.[3] Through the Safe Water Drinking Act established in 1974 and subsequently amended in 1986,[4] federal drinking water standards were established to protect the public health with maximum contaminant levels (MCL) for nitrate set at 10 mg/L.

There is evidence that nitrogen/nitrate levels from the wastewater plume of the proposed septic system may exceed federal standards.

Title 5 of the State Environmental Code, 310 CMR 15.000, in alignment with the Federal Drinking Water Standard, states that "a mass balance analysis required to assure that groundwater quality standards (10 mg/L total nitrogen and 10 mg/L nitrate nitrogen) are met at down gradient sensitive receptors, and at both the private wells to be located on the proposed development, as well as at the private well(s) on adjacent lots."[5] While the developer has not submitted a formal mass balance analysis, two separate hydrology reports have suggested that this may be violated. Specifically, Mr. Horsley concludes in his letter dated 1/26/2016 that the nitrate concentration from the development "can be expected to be approximately 31.6 mg/L as the groundwater enters the 100 foot protective radius"[6] around an abutting well on the property of Eugene Hamm. Mr. James Vernon, an independent hydrologist hired by the Town, concludes, "High Nitrate in neighbor's wells is a real possibility." In addition, Mr. Vernon's analysis suggests that bedrock fractures are likely to carry wastewater effluent in a predominantly east/west direction based on existing fracture patterns, which may increase the likelihood of elevated nitrate/nitrogen levels at both on-site wells and those of abutters, particularly Mr. Ham's.

Elevated nitrate and nitrogen levels as measured in wastewater plumes can be considered surrogate markers for other wastewater contaminants.

Beyond nitrates, other contaminants including bacteria (predominantly coliforms), viruses, and protozoa have been found in wastewater effluent from

---

[1] Weyer PJ et al. Municipal Drinking Water Nitrate level an Cancer Risk in Older Women: The Iowa Women's Health Study. *Epidemiology* 2001:327-338.

[2] Weisenburger D. Potential health consequences of ground-water contamination of nitrates in Nebraska. *Nebr Med* J1993;78:7-10.

[3] Gallagher LG, Webster TF, Aschengrau A, Vieira VM. Using Residential History and Groundwater Modeling to Examine Drinking Water Exposure and Breast Cancer. *Environ Health Perspect.* 2010;118:749–755. doi: 10.1289/ehp.0901547

[4] Safe Drinking Water Act of 1974, 42 U.S.C. §§ 300f to 300j-9 (Supp. IV 1974)

[5] Massachusetts State Environmental Code 310 *CMR 15.216*

[6] Horsley S, Letter to Dan Hill, "Re: : Fields of Sherborn 40B–Hydrology Issues", submitted to BOH and ZBA 1/26/2016

septic systems.[7,8] In addition, hormones, drugs, and household chemicals from wastewater treatment plants are increasingly identified in analyses of private and public drinking water sources.[9] The prevalence of these contaminants of emerging concern (CECs) in private water supplies has been best described in studies from Cape Cod, where the impact is greatest in densely populated residential areas. 85% of homes on Cape Cod use Title V septic systems, and these systems are not only the dominant source of nitrogen in groundwater but also for CECs.[10] In the most recent analysis, evidence for 70% of tested private wells had evidence of several unregulated CECs; contamination was highest in those wells with the highest nitrate levels.[10] Despite differences in hydrology and geology, the similarity of Sherborn's reliance upon septic systems and the subsequent likelihood for groundwater contamination from septic systems is striking.

These CECs have been associated with health risks.

CECs fall into several different categories including pharmaceuticals, disinfection byproducts (DBPs), and endocrine disrupting compounds (EDCs). Unintentional ingestion of pharmaceuticals or their metabolites poses obvious risks to health through direct toxicity and drug-drug interactions. Several chlorinated and brominated DBPs have been implicated as carcinogens and linked to increased risk of spontaneous abortions.[11] EDCs have been linked to hormone-responsive malignancies including breast and prostate cancer, insulin resistance, and alternations in DNA and gene expression.[12]

The development poses a high risk of elevated nitrogen in downgradient wetlands, which also threatens water quality

Wetlands play a critical functionality in helping to preserve clean water through filtration and nitrogen capture. These roles are particularly important in

---

[7] Obreza T et al. Onsite Sewage Treatment and Disposal Systems: Bacteria and Protozoa. Publication SL350 Soil and Water Science Department, UF/IFAS Extension. Original publication date July 2011. http://edis.ifas.ufl.edu/pdffiles/SS/SS55200.pdf

[8] Feachem RG et al. *Sanitation and Disease: Health Aspects of Excreta and Wastewater Management*. 1983. Chichester, U.K.: John Wiley & Sons.

[9] Schaider L et al. Contaminants of Emerging Concern and Septic Systems: A Synthesis of Scientific Literature and Application to Groundwater Quality on Cape Cod. Silent Spring Institute, Newton MA September 2013

[10] Schaider L et al. Septic systems as sources of organic wastewater compounds in domestic drinking water wells in a shallow sand and gravel aquifer *Science of the Total Environment* 547 (2016) 470–481

[11] Savitz, D.A., Singer, P.C., Hartmann, K.E., Herring, A.H., Weinberg, H.S., Makarushka, C., Hoffman, C., Chan, R. and Maclehose, R., 2005. Drinking water disinfection byproducts and pregnancy outcome. Awwa Research Foundation project #2579.

[12] von Saal, F., 2011. New approaches to hazard and dose-response analysis for endocrine disrupting chemicals. Water Research Foundation, Denver, Colorado. September 7. http:// http://collab.waterrf.org/Workshops/edcppcp/Presentations/vom%20Saal%20WaterRF%20EDC-PPCP%20workshop%209-7-11.pdf

communities that do not have municipal water supplies. This role can be overwhelmed by excess nitrogen loading. James Vernon's hydrology report found that "High Nitrate at 'impacted wetland' was very likely", at levels of approximately 29 mg/L.[13] This nitrate efflux would compromise the wetlands critical function and health.

In conclusion, it is my personal opinion, shaped by my professional experience, that the burden of evidence clearly suggests an element of risk to our community's public health, and that that risk is not speculative but in fact likely. As a physician, I find this risk unacceptable. As a resident of the Town of Sherborn, I view the Board of Health's responsibility to advocate for health of its residents, and hold all other boards accountable to respect and support the BOH's mandate. In the face of a reasonable threat to health, it is the Board of Health's duty to speak to those risks, and recommend that the town does not pursue development at the expense of public health threat.

Sincerely,

Charles A. Morris, M.D., M.P.H.

[13] Vernon J. Sherborn Board of Health Meeting, February 11,2016. https://www.youtube.com/watch?v=T776f2M9yRQ&feature=youtu.be&t=2m59s