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Dear Eric,

I hope you are well. As you know I have taken a keen interest in the Toll Brothers site on Whitehall Road. I addressed the Board of Trustees on this issue on May 6, 2016 during public hour.

I am writing to you today and cc'ing the Board and a number of others in leadership whom I have talked to in the last three weeks so that I might stress that going ahead with this development places the University at risk. I have been examining the available science (discussed below) and it all points to a fragile ecological area with connections to the well water.

I presented my assessment of the studies that have been done to the State College Borough Water Authority Board (SCBWA) on Thursday, June 15, 2017 and simply raised a number of concerns I had.

Based on those concerns, the SCBWA added new items to their Board meeting and agreed to look into conducting new studies on the Toll Brothers development site. In particular, a feasibility evaluation for doing a Dye Tracer Study was proposed and approved that would shed light on the statement by their current board member, and Penn State Extension Officer, Dave Yoxtheimer.

“The results of the dye tracing [on Slab Cabin Run] provided independent evidence of the importance of subsurface flows in the transmission of water beneath the surface channel of Slab Cabin Run. This information lead to the conclusion that, in practical effect, there are two Slab Cabin Runs, one in the visible surface channel and another hidden from view in the shallow subsurface“ (See Reference 1 - Whitehall Road project review by David Yoxtheimer of Aqualith Technologies, Oct. 31, 2014)

The movement by SCWBA is a clear indicator that the available science does highlight potential issues of risk with situating this large development so close to the well heads. This important move by SCWBA was noted at the Ferguson Township Board of Supervisors regular meeting on June 19, 2017.*

Let me repeat briefly the evidence I have reviewed that suggests future negative impacts on the two major wells. This is not my area of expertise so it is entirely possible I am mistaken, so I have limited myself to the presentation of facts and direct quotes from the more than 1,000 pages of reports and appendices I reviewed.

This is just an informational exchange to raise my concerns with you and the Board about possible risk.

The Toll Brothers site is in Zone 2 of two wells (Thomas and Harter wellfields). These two wellfields provide more than 65% of the water for State College each day. The aforementioned tracer studies were conducted in November 2005 and December 2006, and reported in January July 2007 in the State College Borough Water Authority Slab Cabin Run Dye Trace Study report authored by Yoxtheimer as consulting hydrogeologist to the SCBWA. (*See Reference 2*).

The studies showed that a tracer dye (Sulphorhodamine B) released into Slab Cabin Run upstream of Well 11 (in the Thomas Wellfield) and Well 25 (in the Harter Wellfield) entered the wells in 5 days. Concentrations were different with higher levels in Well 25 compared to Well 11 (82 ppb/day vs 1 ppb/day), implying different degrees of connection.

Another dye (Fluorescein) released in a dry tributary (Musser Gap) feeding into Slab Cabin Run showed the dye arrived in Wells 11 and 25 between days 20 and 28 at similar concentrations (0.76 ppb/day and 0.56 ppb/day). Interestingly, the dye was detected in Slab Cabin Run after 13 days at a concentration of 1 ppb/day. This according to the author of the report (*See Reference 1 and Reference 2*) highlights a complex subsurface flow, captured in the above quote.

As a geologist, you know that the reason for such interconnectedness is the karst and epikarst nature of the dolomite bedrock in our valley. Although this topography is well known, a repeated counter-argument I have heard has been that it is not a cause for concern as there is plenty of soil that would filter out any contaminants long before contaminated water reaches the wells.

To assess this, CMT Labs did infiltration studies on the Whitehall Road site (*See Reference 3, CMT Infiltration Analysis 1, May 28, 2013 and Reference 4, CMT Infiltration Analysis 2, December 22, 2014*). These are discussed in the June 5, 2015 Final Stormwater Management Report prepared for Toll Brothers by Penn Terra Engineering and submitted to Ferguson Township with other planning documents. (*See Reference 5*).

The site is dolomite rock with very shallow Hagerstown and Opequon soils. The 5.5 acres proposed to house the stormwater detention basin is on top of an existing swale over a fracture zone. The area has extensive sinkholes.

In preparing two reports on the infiltration studies, CMT Labs had to do conventional and non-conventional infiltration tests because the soil was so shallow. It was necessary to also explore the capacity of the bedrock, which is very close to the surface and consists of fully exposed rock in some areas.

The subsoils have “excellent structure/macropore abundance” but their “close proximity..to permeable bedrock” means the soil may not function as the filters such a site requires. That is, the stormwater may pass through the shallow soils into the subsurface. (*See Reference 4 at p. 982*).

As outlined above, the existence of a subsurface Slab Cabin Run connected to the wells means any pollutants from the site would also travel into the wells.

The two CMT reports are not confident in their assessment of the safety of this site and while they did not undertake a formal risk analysis, it is interesting how the report in 2013 (Reference 3) shifted from a safety recommendation factor of 2.0-2.5 to a safety recommendation factor of 3.0 in 2014 (*See Reference 4*)

The CMT reports raised a red flag about compaction. As you know (but perhaps the others cc'd here do not) the ability of soil to filter pollutants rests on the amount of natural holes it contains. Applying pressure to soil results in compaction which reduces the soil's ability to act as a filter. In the first report, CMT Labs advocated that heavy equipment not be used during and after construction of the storm water capture basin. “All heavy equipment should be prohibited from operating or travelling over the infiltration pit” (*See Ref 3 at p. 983*).

Both reports (Reference 4 at p. 984, and Reference 5 at p. 1041) expressed concern regarding the amount of mowing because of the compaction that could occur. Correct planting is needed but the timing of that and the first water to pond in the basin was a concern raised in the second report since there could be a “development of a restrictive layer” reducing infiltration capacity (*See Reference 4 at p. 1041*).

Taken together, the soil analysis highlights a narrow layer, close to the bedrock that is liable to lose its filtration capacity, implying it is perhaps not the ideal location for a basin.

Soil is a natural filter and we can certainly use artificial filters if the soil is not sufficient. Engineering solutions such as a separation filtration are possible but the issue is that these “are prone to clogging over time, and may require long term maintenance. These issues should be discussed with appropriate municipal officials” (*See Reference 3, p. 982*).

I have seen no plans for such maintenance or had evidence that these discussions with Ferguson Township occurred.

So far I have discussed the highly connected nature of the water and the insecurity expressed on the role that the shallow soils at the site can play in filtering the pollutants.

A major issue of course is that a sinkhole opens.

The CMT report states that the karst rock and its permeable bedrock mean “significant subsidence and sinkhole activity could occur” (*See Reference 3, p. 982*).

Farming is the historic land use and it

“does not significantly increase the potential for sinkholes to form on this tract. The significant grading, landscape alteration, increase in impervious surfaces, and channeling of stormwater involved with this project [Cottages] does increase the risk of sinkhole formation and therefore does increase the potential to degrade groundwater quality...

A sinkhole represents a direct conduit into the aquifer which in turn could have direct adverse impacts on regional drinking water quality if significant volumes of surface runoff are channeled into a sinkhole. Based on the recent site walkover with the project engineers on October 23, 2014, and the site inspection by PA-DEP personnel (Kipp Starks, December 3, 2013) there are sinkholes in proximity to the project and therefore they do represent a risk.” *See Reference 1, Oct. 31, 2014 Whitehall Road project review by Aqualith Technologies.*

The 2014 CMT Lab report states:

“In terms of risk management, we do not believe there is an effective method for elimination of sinkholes in karst infiltration areas...and the risk is inherent” (*See Reference 4 at p. 1034*)

With such a large impervious surface planned at this site there exists the potential for marked changes in the pH to more acidic water in the runoff, accelerating erosion of the dolomite rock leading to sinkholes. I am certainly happy to provide references to other case studies where sinkholes formed under basins.

I am neither a hydrogeologist nor a geologist. I am an ecologist. But my reading of the available reports leads me to conclude that we do not have sufficient evidence to state that the placement of this development so close to the major wells is without risk.

The question for us, Penn State, is how much risk are we willing to accept?

My interest is protecting the mission of our University and the noble aims laid out in our strategic plan to be good stewards.

You may have heard that the Supreme Court of Pennsylvania recently established (June 20, 2017) a broad interpretation of the Environmental Rights Amendment (Article 1, Section 27) to the Pennsylvania Constitution, cementing in place the Commonwealth’s role as trustees for public natural resources. The Constitutional amendment states:

“Pennsylvania’s public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people. The people have a right to

clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment.”

This Supreme Court of PA ruling sets aside 40 years of more restrictive interpretations. This is important here because the water in these wells is a common resource. We, as a Land Grant University, have embraced the Environmental Rights Amendment, which we quote in our strategic plan.

I would also draw your attention the Community Bill of Rights adopted by Ferguson Township which states:

“Right to Pure Water. All residents, natural communities and ecosystems in Ferguson Township possess a fundamental and inalienable right to sustainably access, use, consume, and preserve water drawn from natural water cycles that provide pure water necessary to sustain life within the Township.” (See Ferguson Township Community Bill of Rights, Section 1.05)

Finally, were the Toll Brothers plan to be put forward today, it would not comply with the current stormwater management regulations in Ferguson Township, updated in June 2016.

I have heard the argument that the Toll Brothers plan went above and beyond what was required and thus is safe. I have seen no evidence of this and would point out that if they submitted the same plan today it would not be compliant with regulations in place to protect water.

I do not know if we (Penn State) can reasonably state that in selling this land we have no responsibility should the wells get contaminated. But perhaps it is best to observe the precautionary principle and find an alternative solution.

Recently, I drove around for three hours with a local developer and it is clear there are many sites near the University which we could sell to Toll Brothers. I am happy to provide maps highlighting where these are.**

In conclusion, it is my view that proceeding with the sale to Toll Brothers represents a risk to the University. This is certainly in terms of our reputation in this community but maybe a broader risk as we are the State’s Land Grant University and have responsibility to be stewards of our natural resources.

I am happy to serve you or the Board in any way I can as we navigate this issue.

Sincerely

David Hughes

cc: Board of Trustees, The Pennsylvania State University

Works Cited

1. Whitehall Road project review by David Yoxtheimer of Aqualith Technologies, Oct. 31, 2014
2. State College Borough Water Authority, Slab Cabin Run Dye Trace Study, July 2007, by David Yoxtheimer.
3. Infiltration Analysis 1, by CMT Laboratories, Inc., May 28, 2013
4. Infiltration Analysis 2, by CMT Laboratories, Inc., Dec. 22, 2014
5. Stormwater Management Report, by PennTerra Engineering, June 5, 2015 (includes the two CMT infiltration analyses list above, as appendices).

* Update 1, Dec. 11, 2017: The State College Borough Water Authority subsequently dropped its plans to conduct dye trace studies at the Penn State/Toll Brothers site, without explanation.

** Update 2, Dec. 11, 2017: During July and August, 2017, after this letter was sent to Barron and the Penn State trustees, Nittany Valley Water Coalition worked with Toll Brothers and representatives of the Penn State University Real Estate Services division to identify alternative parcels for a land swap. Toll Brothers representatives conducted feasibility studies in September and October on an alternative parcel at West College Avenue and Blue Course Drive. On October 31, Toll Brothers filed a letter of intent with Penn State officials, expressing interest in purchasing the alternative site instead of the groundwater recharge parcels at Whitehall Road and Blue Course Drive. To date, Penn State has not responded to the letter of intent.

Additional Studies

Geology and Mineral Resources of the Bellefonte Quadrangle, PA, by C. Butts and E.S. Moore (1936)

Hydrogeologic Factors Influencing Well Yields and Aquifer Hydraulic Properties of Folded and Faulted Carbonate Rocks in Central PA, by S.H. Siddiqui (1969)

Hydrogeology and Geochemistry of Folded and Faulted Carbonate Rocks in the Central Appalachian Type and Related Land Use Problems, by Parizek, White, and Longmuir (1971)

The Effect of Lithology and Other Hydrogeologic Factors on the Development of Solution Porosity in the Middle Ordovician Carbonates of Central PA, by H.W. Rauch (1972)

Hydrologic Budget of Spring Creek Drainage Basin, by M.T. Giddings (1974)

Groundwater Resources of Centre County, by C.R. Wood (1980)

Soil Survey of Centre County, by W.L. Braker (1981)

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Determination of Wellhead Protection Areas, by Nittany Geoscience, Inc. (1992)

Groundwater Management and Development Plan, Upper Spring Creek Basin, by R.E. Wright Associates (1992)

User's Guide for MODPATH/MODPATH-PLOT Version 3: A particle tracking post-processing for MODFLOW, by US Geological Survey (1994)

Water Budget for the Spring Creek Basin, by L.E. Taylor (1997)

Gridded Surface Subsurface Hydrologic Analysis (GSSHA) by C.W. Downer and F.L. Ogden (2002)

Safe Well Yield Evaluation, by US Filter (2002)

Watershed Modeling System Tutorial - Vol. 1, by Environmental Modeling Research Lab (2004)

State of Water Resources Report, by Spring Creek Watershed Community Water Resources Monitoring Project (2004)

SCBWA Long-Range Plan, by State College Borough Water Authority (2004)

Hydrologic Setting and Conceptual Hydrologic Model of the Spring Creek Basin, by J.W. Fulton, E.H. Koerkle, S.D. McAuley, S.A. Hoffman and L.F. Zairr, USGS Scientific Investigations Report (2005)

SCBWA Sourcewater Protection Report and Appendices, by N.A. Water Systems/David Yoxtheimer (2007)

SCBWA Slab Cabin Run Dye Trace Study, by N.A. Water Systems/David Yoxtheimer (2007)

SCBWA Presentation to Ferguson Township Board of Supervisors, by SCBWA (2015)
https://www.scbwa.org/sites/default/files/news/SCBWA_Ferguson_Twp_Presentation_July_7_2015.pdf