



Wednesday, December 05, 2018

Warden & Simcoe County Council  
County of Simcoe Administration Centre  
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Re: impacts of aggregate extraction on groundwater resources

Dear Warden and County Council,

I am writing to express my profound concern regarding environmental impacts of aggregate extraction on our groundwater resources. I wish to propose a moratorium on expansion of aggregate extraction in the Waverley Uplands, until the impacts on groundwater flow systems are fully understood. Many if not most residents of Springwater, Tiny and Tay Townships depend on groundwater resources for their drinking water, and there are legitimate concerns about increasing impacts on water quality. It seems to me that the potential impacts of aggregate expansion on our groundwater resources are either being overlooked, or not carefully considered. At the same time, the value of our groundwater resources is being underestimated. I hereby request an opportunity to present my case to Simcoe County Council in person, in May of 2019.

### **Impacts of aggregate extraction on groundwater resources**

The impacts of aggregate extraction on groundwater resources are well known to the scientific community. The following quotation is from a recent Canadian study, published in an international, peer-reviewed journal:

*“The extraction of sand and gravel for construction purposes stands out as a major concern with respect to groundwater protection. Sand and gravel extraction activities commonly involve (1) the removal of vegetation and soil cover, (2) the modification of natural surface slopes, (3) a reduction in the unsaturated layer thickness, and (4) increased risks related to the spill of polluting substances during mechanical operations. As a result, groundwater quantity, quality and temperature can be impacted, along with dependent ecosystems” (Nadeau et al., 2015, p.536).*

Studies have shown that sand and gravel pits can lead to increasing groundwater temperatures (Markle and Schincariol, 2007), groundwater pulses (Smerdon et al., 2012) and increasing trace metal concentrations in receiving waters (Bayram and Önsoy, 2015), to cite a few examples.





According to John Cherry, Emeritus Professor at the University of Guelph and author of the leading textbook on groundwater, the literature about groundwater impacts from excessive disturbances generally shows that it is extremely difficult or technically/ economically impossible to restore the groundwater to its original quality. Therefore, the prevention of adverse impacts is by far the most economically prudent strategy of managing these natural resources.

### **Natural filtration of water by soil**

At this time, there are so many unanswered scientific questions about the groundwater resources of Springwater, Tiny and Tay Townships. In fact, our understanding of the Quaternary geology of the area is only now being studied in detail by the Ontario Geological Survey. While the specific impacts of aggregate extraction on our groundwater resources are poorly understood, we do know that the filtration of the groundwater takes place in the soils of the uplands. Some combination of plants, minerals and microorganism evolving together over thousands of years have created what amounts to a perfect water filtration system. Imagine these soils as a kind of organism, with all the parts of the system so intimately related that changing any one of them will bring on changes to the entire organism: those changes will, with time, impact the function and ultimately destroy the organism. Removing those soils to extract the aggregate simply removes the water filtration system. At the same time, aggregate extraction removes the water towers which give rise to our remarkable artesian flow systems.

### **Groundwater quality: trace metals**

While the physical hydrology of the artesian flow systems may be poorly understood, there is one thing we understand very well: the quality of the water. The remarkable quality of our groundwater resources has long been known to the residents who depend on it for drinking. From a scientific perspective, I have been testing these spring waters on and off for almost 30 years, first at my laboratory at the University of Berne (Switzerland), then at the University of Heidelberg (Germany), and now at the University of Alberta. Using metal-free, ultraclean research facilities at each of these universities, I have shown that these spring waters contain lower concentrations of trace metals such as lead (Pb) than ancient arctic ice (which I have also tested). The quality of the waters in these artesian springs has been documented in international, peer-reviewed scientific journals. In fact, these spring waters have become the “gold standard” that was used to show that bottled waters from around the world are all contaminated, either because of antimony (Sb) leaching from PET plastic containers, or lead leaching from glass bottles.

### **Groundwater quality: nutrients and organic contaminants**

My report on nutrients and organic contaminants in these groundwaters was submitted to the Mayor of Simcoe County, the CAO, the Clerk and Councillors of Simcoe County, as well as the





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Chair and Members of the Site 41 Community Monitoring Committee, on June 30, 2009. I noted in that report that nitrate and phosphate were both below the limits of detection using state-of-the-art ion chromatography. Despite the sensitivity of the methods used at the laboratory in Switzerland for determining organic contaminants, none could be measured. In fact, none of the contaminants could even be detected. According to the analyst, Dr. Jean-Daniel Berset, he had “never before seen such a clean groundwater”. In fact, it became his “reference groundwater” for his subsequent studies, simply because he could not detect any anthropogenic organic compounds in the water.

### **Groundwater quality: chloride**

Professor John Cherry considers chloride concentrations one of the best indicators of human impacts on groundwater. He defines “pristine” groundwater as having chloride concentrations less than 5 milligrams per litre (parts per million). When I showed him my chloride concentration data for the groundwaters of the Elmvale area (1 milligram per litre), he said that he has “never before seen cleaner groundwater anywhere on Earth”. As the most cited groundwater scientist in the world, this is a profound statement and one well worth remembering.

### **Groundwater quality: radioactive fallout**

Professor Ian Clark of the University of Ottawa is one of the world’s leading experts on dating groundwater. His studies of the groundwaters of the Elmvale area have shown that many of the artesian flows (such as the one at the Elmvale Water Kiosk) are free from radioactive fallout (tritium) from the 1960’s. The water in some of these artesian springs, therefore is hundreds, if not thousands of years old: this makes the water more unique, and more precious.

### **The cleanest groundwater on Earth is worth protecting**

When the scientific observations described above are considered together, it can reasonably be argued that these are the cleanest natural waters on Earth. I have no doubt about their unique quality and inherent value. These artesian spring waters have supported the inhabitants of the region for millennia, and every effort should be made to protect them for future generations. It is difficult to understand how the short-term economic gain from aggregate extraction could be seen as being more important than the long-term environmental sustainability of managing our pristine groundwater resources. A changing global climate system will only increase the inherent value of these waters.

### **The Elmvale Foundation: public awareness and environmental education**

The Elmvale Foundation is a federally registered charity for environmental education. We are helping to change the way we think about water. As a non-profit, science-based organization dedicated to environmental research and education, we help to educate people of all ages and





from all walks of life about the importance of our water resources: we generate awareness about current issues of water security, promote conservation, watershed protection, and environmental stewardship. The Foundation achieves its goals by hosting community events (primarily the annual Elmvale Water Festival), supporting water-based research at all levels, and providing global access to this information via our website ([www.elmvale.org](http://www.elmvale.org)).

Since my first presentation to Simcoe County about these remarkable groundwaters (September 26, 2006), we have hosted the Elmvale Water Festival for 12 successive years. We held several events in Elmvale to celebrate World Water Day, and helped to create the Elmvale Water Kiosk: this provides shelter to the public while they are filling their water bottles at the artesian spring on the east side of County Road 27, just north on Elmvale ([www.elmvalewater.org](http://www.elmvalewater.org)). Reports of our efforts have appeared in four magazines including *Alive*, *Canadian Geographic* and *Water Canada*. Media coverage has included the *Toronto Star*, the *Globe and Mail*, *Global TV*, and *CBC TV* ('The National'). Further, our work has been featured in two documentary films (one is currently in progress) and highlighted in a third documentary film (about plastic pollution). Finally, these remarkable spring waters have been described in at least 100 scientific presentations at regional, provincial, national and international conferences, and in at least 30 public lectures. We will continue to raise awareness and help educate the general public about these remarkable groundwater resources.

### **The Elmvale Groundwater Observatory: a unique research facility**

These unique groundwaters are so clean, I have had to design and construct dedicated groundwater sampling wells for my own research. Since my presentation to Simcoe County in 2006, we have installed two research wells in stainless steel, and one using metal-free plastics such as polypropylene and Teflon, on our family farm property north of Elmvale. In fact, this water is SO clean, ambient air became the greatest single risk of sample contamination. As a result, we had to design and construct laminar flow, clean air cabinets with HEPA filtration, to place on top of the wells, so that water can be sampled inside the cabinet where there are no dust particles. Thus, the Elmvale Groundwater Observatory (EGO) was born, and as far as we know, is the first facility of its kind in the world, for trace metals research.

In contrast to this modest effort, the existing groundwater monitoring network in the Elmvale area is inadequate to answer the important questions concerning the long-term impacts of aggregate extraction on the pristine water. To fill this gap, I have assembled a team of highly qualified experts to assess and design an appropriate groundwater monitoring system that makes use of the modern technologies needed for this important endeavour. I will be writing separately, from my University of Alberta address, about this opportunity for Simcoe County.





## Summary

The water resources of the Elmvale area helped to sustain First Nations peoples for millenia. Today, the pristine groundwaters and network of artesian flows are a source of immense pride, and highly valued by residents: for drinking, for agriculture and for ecosystem health. Judging by the popularity of the Elmvale Water Kiosk, and the distances travelled by some visitors, appreciation of these remarkable waters will only grow. I am confident that public opinion will weigh very heavily on forces which damage the recharge areas representing the source of these artesian flow systems. The long-term costs of degrading our groundwater resources will certainly outweigh by a considerable margin the short-term gain represented by aggregate extraction.

With all due respect, I hereby request that the County of Simcoe consider a moratorium on expansion of aggregate extraction in the Waverley Uplands, until the impacts on groundwater flow systems are fully understood.

I further request an opportunity to present my case to Simcoe County Council in person, in May of 2019.

Sincerely,

William Shotyk, Ph.D. , Dr. rer. nat. habil., P.Ag., FRSC  
President, Elmvale Foundation

cc:

David Parks, Director of Planning, Economic Development and Transit  
Jill Dunlop, MPP, Simcoe North  
Bruce Stanton, MP, Simcoe North  
Springwater Township Council  
Tay Township Council  
Tay Township Council  
Elmvale Foundation, Board of Directors  
Elmvale Foundation, Science Advisory Board  
Prof. John Cherry, University of Guelph  
Prof. Ian Clark, University of Ottawa  
Michael Jacobs, Editor and Publisher, Springwater News





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