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To the Board of Trustees of the Hagensborg Waterworks District,

The purpose of this letter is to provide an update on the point-of-entry water treatment pilot project currently underway in the Hagensborg Waterworks District.

**Commercial Pilot Installations**

The installations at the commercial pilot project locations were completed during the summer of 2013.

**Turbidity Events**

A key aspect of the pilot project has been the evaluation of the severity and frequency of turbidity events and the response of the POE treatment equipment to these events. As expected, it was identified in the fall of 2012 that severe short-term turbidity events in the watershed could result in turbidity levels that could reduce UV transmittance after pre-treatment to a level that would cause a UV alarm condition at individual POE locations. While such alarm conditions were only triggered during 2 severe turbidity events in 2012 (during one such event, raw water turbidity reach over 1,800 NTU), a solution to ensure maximum consumer satisfaction with the POE system, to reducing the sediment loading rate on the pre-filters, and to reduce distribution system flushing/maintenance costs was deemed desirable.

In co-operation with the local federal fish hatchery, remote real-time in-stream turbidity monitoring equipment has been installed in Snootli Creek upstream of the Hagensborg water intake. The District's water system administrators now receive alerts by email and phone in the event of a significant increase in turbidity in Snootli Creek. Two alert levels have been established, a lower level alert at 40 NTU and an extreme turbidity alert at 100 NTU. Data from the system is being correlated to UV dose and alarm condition information from the POE systems, to determine an intervention level. If this turbidity level is reached, District personnel can close the intake before the turbidity level reaches a critical point at the intake thereby preventing highly turbid water from entering the distribution system. A significant amount of water remains in the intake gallery and the vertical distribution pipes between the intake and the valley floor so as to provide water to the community at a satisfactory pressure for the duration of most turbidity events.

Various options to provide a back-up water source during severe turbidity events have been explored. The District recently drilled a well adjacent to the existing intake and is now evaluating the water chemistry as a potential back-up water source that can be used during extreme turbidity events. Upon the receipt of favorable water chemistry, the District will apply for VCH approval for the new source and for a construction permit for the required alterations to tie the well in to the existing distribution system.

Turbidity data from the pilot project and new in stream monitoring program suggests that while they can be severe, the turbidity events are short lived, generally only a few hours to a little more than a day. It is anticipated that the new well, combined with water in the existing distribution lines will be sufficient to meet water demands during a severe turbidity event. Accordingly, high UVT transmittance will be maintained during turbidity events and the POE systems will continue to meet the treatment objectives thereby reducing low UVT alarm conditions. By preventing highly turbid water from entering the distribution system, operating costs are expected to be reduced (POE pre-filters as well as labour costs to flush the distribution lines).

**Remote Monitoring of POE Systems**

HomePlus Products has completed testing of various remote monitoring options. It should be noted that there are presently no commercially available monitoring systems so the monitoring equipment had to be developed in-house. Two levels of remote monitoring were developed. The standard monitor incorporates an auto-dialer that will call out to alert District personnel in the event that an alarm condition is registered at a POE system. The notification system will call up to 3 separate numbers and will provide the address of the alarm. A pilot of this remote monitor is being installed at one of the POE locations in November 2013 and will be monitored over the remainder of the pilot project.

A prototype of an advanced remote monitor was been developed. In addition to monitoring alarm conditions, this system also monitors UV transmittance (alert at pre-determined level), ambient air temperature, and water leaks. The UVT monitor gathers data from the UVMax Pro10's intensity monitor. A warning threshold can be established to provide alerts as to potential future alarms before they happen so as to allow for proactive maintenance. This system uses the same auto-dialer technology to alert District personnel.

HomePlus is currently working to establish a commercial version of this product that could be employed on this project and others like it. HomePlus expects to launch the commercial version of the product in the early Spring of 2014 at which time it would be available for testing and consideration by the District. **New Flow Metered Alarm System & True Dose Monitoring for UVMax Pro Series UV Systems**

In January 2014, Viqua will be launching its latest generation of Pro Series UV sterilizers. These new units will be known as the Pro10-S, Pro20-S, and Pro30-S. These new models have already received NSF validation (Standard 55, Class A) and are now available to the District for testing.

The latest generation UVMax Pro Series models (Pro10-S, 20-S and 30-S) include a new feature not found in any other residential/light commercial NSF-validated UV system – true dose monitoring. Most NSF-validated UV systems monitor only the UV intensity and assume that the system is always running at maximum capacity when calculating dosage and determining alarm conditions. This results in unnecessary UV alarms during many conditions when actual UV dose is far higher than the validation dose due a difference between the actual flow rate and the maximum flow rate capacity. Such alarms often occur due to the heating of water in the chamber during extended no-flow conditions, or due to temporary minor decreases in UV transmittance as a result of sleeve fouling or feed water conditions (turbidity increase due to rain event, etc.). The latest generation UVMax does not assume that the maximum flow capacity is always being used – instead, it uses a flow meter to measure the actual flow rate and uses this and the UVT to calculate the true real-time dose. The true realtime dose is used to trigger the alarm conditions. This enhancement will greatly reduce "false" alarm conditions in UV sterilizers due to temperature management issues during extended periods on inactive water flow. During what would often be an alarm event at full capacity is most often not an actual alarm event at a lower flow rate. This technology will therefore allow users to continue to demand fully-treated water at a lower flow rate (having received the validated UV

dose) during conditions that would have previously caused alarm conditions and shut-off the water supply completely via the solenoid valve. Is essence, this technology has the capacity to greatly reduce user frustration with conventional monitored UV sterilizers, and provide an additional level of redundancy by preventing unnecessary alarms at lower flow rates. Many UV alarms can simply be avoided by reducing the flow rate of the water through the system. Once the situation causing the low UVT can be remedied, the full flow capacity can be restored but at least some treatment capacity is available in the meantime.

The flow meter must be installed such that there is a minimum of 10 pipe diameters of pipe on the inlet side of the flow meter before any unions or elbows (10 inches for one inch pipe). This is done to reduce turbulence that could interfere with correct operation of the meter. In accordance with the manufacturer's recommendations, the flow meter is installed on the inlet of the UV sterilizer.

In the case of Hagensborg, since the vast majority of residential applications do not demand the full 10 gallon per minute capacity of their Pro10 UV systems, having a UV system that more accurately determines alarm conditions based on actual flow demand rather than the unutilized capacity will reduce the likelihood of unnecessary UV alarms during conditions where UVT declines slightly below 75% due to turbidity events but actual UV dose remains well above the NSF validation dose of 40 mJ/cm2. This will, in turn, reduce costs associated with service calls related to minor reductions in UVT due to turbidity events, etc. and increase consumer satisfaction with the equipment.

To evaluate the performance of this new flow metered Pro Series model, the District is seeking VCH approval and a construction permit to immediately upgrade one of the residential POE systems to the new Pro10-S model to test its performance during the remainder of the pilot program. The upgrade involves the addition of the flow sensor on the inlet side of the treatment system, the replacement of the UV control panel, and the replacement of the COMM Centre data logger. The NSF validation certificate is attached for your records.

**Conclusion**

The District continues to have a favorable experience with its POE pilot program. The steps that the District is taking to address infrequent severe turbidity events (remote in-stream turbidity monitoring, back-up water source, and new flow metered UV alarm system) are expected to provide cost-effective solutions to address turbidity spikes without the need to additional costly treatment equipment. The District looks forward to reporting the results of its pilot project in due course.