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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 ongoing Point-Of-Entry Treatment Pilot Project from the perspective of HomePlus, and to provide some feedback on our findings since our last major update in November 2013.

As you are likely aware, I visited Hagensborg in early September to meet your new contractor, Ryan, and to have a meeting with the Board regarding the next steps in the project.

This summer, we reached the 2-year anniversary of the installations at the residential pilot project sites. The POE systems were ready for their scheduled UV lamp replacement (2 year life). With the termination of Robbie's contract earlier this year, it was unclear which locations had had their UV lamps replaced. We were able to visit 3 of the 7 POE pilot project sites during my visit. We determined that in 2 of the locations, the lamps had not yet been replaced. In the third location, the lamp had been replaced, however, the lamp replacement reminder system had not been reset as required after the lamp replacement. As the system is designed to provide ongoing alarms after the 2 year lamp life is reached to ensure that the lamp is replaced on schedule, the homeowner had been experiencing ongoing alarms for several weeks. Fortunately, we were able to explain the reason for the alarms, and of course, reset the lamp life reminder system on the unit as should have been done earlier. I have asked Ryan to inspect the lamps in the other POE systems.

I was disappointed to have not had the opportunity to visit the other POE pilot project sites during my visit. I had expected that appointments would have been scheduled as requested. Fortunately, I was able to spend the extra time with Ryan. We covered general training in maintenance and troubleshooting. He seemed to pick things up quickly. Before departing the valley, I helped him mount the first commercial system in preparation for its upcoming connection (at Rip Rap). I feel he is well equipped to proceed with the installation and commissioning of the commercial systems, as well as the general maintenance of all of the systems.

I met with Ken and Don and we discussed much of what follows in this report.

Before leaving the valley, I was also able to meet briefly with your DWO, Phil Muirhead, who happened to be in Hagensborg on other business. I discussed with him the need to run the pilot project through to the spring in order to assess the effectiveness of our turbidity treatment/mitigation strategies, and to obtain some data from the commercial installations. Phil was understanding of the need to extend the project to

ensure that the objectives of the pilot project were met. I recommend that some level of official communication with VCH informing them of the extension of the pilot project be initiated ASAP.

COMMCenters

The COMMCenter is the little black box that logs data from the UV system. It was reported to me earlier in the year that several of the COMMCenters had experienced a simultaneous failure. The problem was reported as a blank LCD screen. 3 of the COMCenters were shipped back to me in Kamloops for testing at our facility as any failure of this component is very rare, never mind several at or very near the same time. Upon arrival, the first of the "failed" COMMCenters was installed on our test system and it immediately booted up. The screen was not blank, but the UV dosage was showing in the LCD display. Each UV system connected to a COMMCenter is assigned a digital address by the COMMCenter. The problem was simply that the address was not being recognized so it was not finding the system it was looking for (and therefore did not know the dose to display). I immediately reset the address and the dosage display came back on line. While not a common problem, this should have been identified in the field. The good news is that all of the COMMCenters that were believed to have failed had the same issue. This issue is normally caused by electrical supply problems in the power grid. I suspect that this was the underlying cause. I have trained Ryan to identify this problem and how to rectify it if it happens again. The COMMCenters that were removed were not logging data for several months since they were removed. I do not believe this to be a significant issue from a data perspective. Ryan is putting the COMMCenters back in service as he comes across ones that are missing while he goes about his regular maintenance.

Extension of Pilot Project

Per my meeting in Hagensborg with Don and Ken, we still require some information/data from the pilot project to fully assess the performance and costs associated with the POE system.

Firstly, we had made several recommendations earlier regarding the implementation of mitigation measures to address the periodic but infrequent turbidity events that have resulted in UV intensity alarms. The first of these recommendations included terminating the intake of water from Snootli Creek during any turbidity event that exceeds roughly 30-40 NTU. The hatchery has installed an inline continuous turbidity monitoring device upstream of the intake and has the capability to send this data to the District. An agreement was put in place by Leslie to get access to this data as well as to get immediate alerts in the event that the turbidity threshold is exceeded. It is important that we ensure that we have access to this information and that we are responding to alerts by closing the intake until the turbidity event has passed (who receives the alerts and do we have a plan of action to respond to them?). Now that the well is on stream, we have a back-up water source during such an instance. In addition to preventing alarms at the POE equipment, preventing the high turbidity from entering the distribution system will extend the life of the POE filters and reduce distribution system maintenance requirements (blowing out the lines). It is important to note that once water test results from the well are receive, approval of the new source by VCH will be required before it can be fully tied in and used. I would like to review the results as well to access the potential impact on the POE equipment. Please send me a copy when it is available and obtain the necessary source approval paperwork from Phil if you have not already done so.

Ryan recently installed the new flow-meter technology on Leslie's POE system. I have sent a new COMMCenter out to the District to use with this system (the old COMMCenter does not recognize the new technology). By monitoring UV dose based on the actual flow rate instead of the rated system capacity flow rate, the system is able to recognize if the true UV dose exceeds minimum standards during temporary conditions where UV transmittance may decline due to turbidity. This should enable the system to avoid

alarm conditions during turbidity events that otherwise would have caused an alarm condition (since actual flow rate is almost always less than the capacity of the system). We feel that it is important to evaluate this piece of equipment during a turbidity event. Accordingly, we would like to monitor the system for several months to see if we can obtain sufficient data to evaluate this device relative to the other POE systems in the valley.

I have also ordered and expect to receive in the next 2 weeks, a highly specialized 0.35 micron cartridge filter. It is proposed that we install this filter in place of the current 1 micron absolute filter in one of the pilot project sites to see if it makes a meaningful difference during a turbidity event. Evidence obtained from filtering and re-testing samples obtained during previous turbidity events suggests that it could make a meaningful difference sufficient to avoid an alarm condition. Again, we may require several months of monitoring after installation for a turbidity event to occur to enable us to fully assess the outcome of this approach to turbidity treatment.

It is recommended that the pilot project be extended until the spring of 2015 to assess the above techniques to handle the turbidity events as well as to test the commercial POE equipment which we recommend be installed as soon as possible.

Interim Equipment Recommendations

Further to my conversations with Ken and Don last month, I am recommending that at least 2 of the pieces of equipment used in the pilot project be dropped from the final project:

COMMCenter - The COMM Center has been a valuable data-gathering tool during the pilot project, however, we do not believe that it is economically advisable to install it in every home in the final project. This will reduce the cost of each POE system by about $350. Instead of installing COMMCenters in every location, we recommend that a small number COMMCenter units be maintained in inventory for use by service technicians and for troubleshooting purposes. If data gathering and logging is desired by VCH or the District, a small number of service locations can be selected for COMMCenter monitoring (the selected sites could be representative of different areas within the distribution network).

Leak Detection System – Recent amendments to the plumbing code regarding lead-free component validation have resulted in a significant increase in cost for the leak detection and auto shut-off system. In the 2 years of the pilot project, no known leaks have occurred, thereby giving us some history that we can take to your insurance company to ensure adequate insurance coverage exists to cover this risk rather than addressing the risk through equipment at each POE site. We feel that the ongoing annual insurance cost will be far less than the cost and maintenance of the leak detection equipment. Dropping the leak detection system will reduce the cost of each POE system by about $300 based on the original budget ($570 based on the new cost).

UPS – The uninterruptible power supply has an audible alarm similar to that of the UV system. When the battery in the UPS is low following or during a power failure, it will send out an audible alarm. There is some evidence that this has been confused by homeowners as being a UV system alarm during the pilot project. During power outages, the UPS battery alarm has therefore been a bit of a nuisance to some homeowners, especially if the alarm happens at night. There is no evidence that the larger UPS that we tested is providing additional benefits as compared to the smaller unit tested. We would recommend that the smaller unit be incorporated into the final system, if at all. We feel comfortable with dropping the UPS power back-up altogether as long as a suitable surge protector is installed in its place. This would reduce

the price of each POE system by about $80 and reduce the likelihood of a battery alarm nuisance. We may be able to find a UPS without an audible alarm feature, or disable it.

Interim Budget Considerations

As would be expected, the prices of some of the POE system components have risen over the past several years. The revised budget includes the new flow meter true dose monitoring technology and new composite solenoid valve (meets new lead-free validation requirements).

(all prices per unit)

Fully-assembled POE System excluding options below:
Budget April 2011: $1,984
Revised Budget October 2014: $2,170

Options (these options were all used in the pilot project):
COMMCenter: $356 – not recommended for all installations
Leak Detection System: $569, (meets new lead-free validation requirements) - not recommended for all installations.
UPS Upgrade from Surge Protector: $100

The pilot project has provided evidence that the filter cartridge life has exceeded original expectations. We are awaiting some documents (service labour invoices) from the District for us to analyze system operating costs to date including both parts and labour. Details will be provided upon completion of our review. Fortunately, the cost of replacement filter cartridges have not changed a meaningful amount and lamps and sleeves have increased proportionately with inflation only.

Final Report

One of VCH's requirements on the pilot project approval was to have an engineer prepare and review the final pilot project outcome report. We feel that it is important to begin the process of determining which engineering firm will be participating in this review and to what extend HomePlus shall be participating in the compilation of the final data and report. As noted in our recent meeting, HomePlus would be pleased to be involved to whatever extent is deemed appropriate and desirable by the Board. Our hourly chargeout rate would certainly be significantly lower than that of an engineer, so it may be more cost-effective for us to compile and summarize the majority of the raw data and have the engineering firm provide its opinion thereon. I await your guidance as to the level of involvement that you would like us to have. In any event, you can be assured of our full co-operation with the engineering firm.

Public Communication

I understand that the Board wishes to provide an update on the pilot project in an upcoming newsletter. As we have done before, I would be pleased to provide some suggested wording. Just let me know if you are interested.

Information Required – Follow-up Required

There are a number of items that need to be addressed for HomePlus to continue its review of the pilot project data, and to ensure that the pilot project objectives are met by spring:

- Ensure all residential POE systems have received their scheduled 2 year lamp replacement
- Install new COMMCenter at Leslie's house when it arrives
- Obtain a full water analysis (potability analysis) for the new well (please send me a copy)
- Obtain new source approval from VCH to tie the well into the distribution system
- Complete the installation of the commercial pilot project units
- Ensure turbidity alerts are appropriately set and being routed to an person with a plan to react accordingly during a detected event
- Obtain access to past turbidity data as logged by the Fisheries turbidity meter (this will be valuable for accessing the frequency and extent of minor turbidity events in the watershed and their impact on UV dose at the POE systems (we can compare to dose data from the COMMCenters)
- Please provide copies of Robbie's labour invoices for the original installations, water sampling, and POE system maintenance to date. These will be used to assess installation costs and maintenance costs. Sampling costs will be distinguished from actual operating maintenance costs for the purposes of the final cost report.
- Select an engineering firm for the final report.
- Provide guidance on the desired scope of our involvement in the final report.

I will provide to the Board in time for your November meeting (subject to getting the necessary raw rate on a timely basis):

- Details of installation and operating costs (labour and parts) to date and projections.
- Detailed equipment budget an life cycle operating cost estimate.
- Updated turbidity and UVT testing data from remaining samples from POE project, and impact on UV dose.

Turbidity Event Monitoring

In order to fully assess the new flow sensor technology and 0.35 micron filter, we may want to allow at least one significant turbidity event to occur without implementing the back-up well. This will provide the most useful data for the pilot project. I will leave this to your consideration. In the event of a significant turbidity event, please gather as many samples as possible from at least one site (does not have to be a pilot project site, just a site connected to the system, or from the intake or Snootli Creek Bridge, etc. Hourly turbidity data from such an event would be very useful.

Please feel free to contact me if you have any questions.

Regards,

Grant Robertson, B.B.A., CWT
Certified Water Technician
HomePlus Products Inc.