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October 8, 2021

Kristine L. Wheeler, P.E., Director
Bureau of Water Supply Protection
NYS Department of Health
Empire State Plaza
Corning Tower
Albany, NY 12237

Re: Inc. Village of Hempstead - Progress Report
for 1,4 Dioxane MCL Deferral – Q3 2021
Public Water System ID# 2902827

Dear Director Wheeler:

We are the consulting engineer to the Village of Hempstead Water Department and we write on its behalf. This summary report of activities is submitted in compliance with the requirements listed in your letter dated January 8, 2021, which granted a deferral for enforcement of the 1,4 Dioxane Maximum Contaminant Level (MCL). Continuation of the Deferral was based on the Village meeting the conditions listed in your letter.

Condition 1

Condition 1 required that public notification be made within 30 days of your letter. The Village had the notice published in the Hempstead Beacon on January 22, 2021. The receipt and confirmation of publication was attached for your records with the Q1 report.

Condition 2

Condition 2 required preparation of this quarterly progress report and submission to NYSDOH by the 10th day of the month following each calendar quarter. This report is therefore due by October 10, 2021 for the third quarter.

Activities during the third quarter of 2021 included continued operation and sampling of pilot scale treatment units as described in detail below. Other activities included completion of a water rate study with a five year capital plan including very significant rate increases to make funds available to construct and operate the treatment systems now being investigated. A third significant development for the water system was obtaining permission to drill test wells for a third water plant at one of the few open parcels remaining within the village.

As mentioned in a previous quarterly report, the Village was actively developing a long term master plan for the water system. This included long term (10 year) capital projections and development of detailed budget projections over a five year period. A water rate study was performed to implement new water rates configured to support the cost of the new AOP treatment systems and associated pretreatment. A televised public hearing was held on June 29,

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2021 at which the board approved water rate increases for the next two years to help pay for these improvements at the Water Treatment Plants. The rate increase became effective on August 1, 2021 with further increases on August 1, 2022 so the increase in revenue is just starting to be reflected in the current water bills. The new rate structure also includes a change from bi-annual to quarterly billing which will smooth out the receipt of water revenues.

Water Plant treatment pilot activities continued during the third quarter of 2021 with mixed results. The Village wells have relatively high concentrations of iron relative to the surrounding water suppliers impacted by 1,4 Dioxane. The two wells located at the Laurel Avenue plant are treated by a manganese green sand iron removal filter. The seven wells located at the Clinton Street water plant have had iron reduction as a byproduct of other aeration processes which has generally removed about half of the iron with no additional treatment.

The Village of Hempstead has an unusual problem compared to most other water suppliers on Long Island in that it is impacted by VOCs originating from the Roosevelt Field groundwater plume, while also having high concentrations of iron. The 1,4 Dioxane impacting Clinton Street seems to overlap that plume. Iron concentrations tend to increase for wells located further south on Long Island, while VOC contamination, and the coinciding 1,4 Dioxane contamination, is much less common in the southern portion of the Magothy Aquifer. Other wells impacted with 1,4 Dioxane tend to have lower concentrations of iron.

The pilot which has been in place for months is the Purifics Water, Inc. Advanced Oxidation Process (AOP) pilot system, which is based on titanium dioxide (TiO₂) activated with UV light, with an iron removal aeration and prefilter system. This system was of great interest to the Village as it was claimed to be suitable to work without the time and expense of building a full scale iron removal filtration system prior to running an AOP pilot.

Initial pilot work was focused on determining the ability of the Purifics system to work with the lower iron concentration wells, such as well 5, with selected runs also being made on wells having higher iron concentrations. Layers of complexity were added based on the ability to use the existing air stripping towers (ASTs) with or without the Purifics Ceramic Ultrafiltration (CUF) pretreatment unit, which is installed on the pilot. Use of the ASTs reduces the iron concentrations and removes the VOCs (a variety of industrial solvents and Freons) but also strips out carbonic acid (as carbon dioxide) and consequently raises the pH of the water. The CUF has an additional air feed and can remove oxidized iron.

The Purifics unit was able to achieve up to 97% removal of 1,4 Dioxane. Unfortunately, these results were not consistent and a wide variety of sampling runs were undertaken with aeration, without aeration, with aeration followed by pH adjustment via a CO₂ feed, pH adjustment with acid, upward pH adjustment with caustic to increase removal of iron and calcium, and similar runs for wells with low iron and higher iron, etc.

The results of this pilot will be detailed in a pilot report which is now being prepared. The preliminary findings suggest that the treatment system is not sufficiently stable for full scale use,

possibly due to calcium deposition and lamp power issues. Removal of iron did seem to be adequately achieved and the CUF units may be worth using in combination with another AOP treatment unit.

The Village decided to continue testing with Purific Pilot when the CTO and Applications Manager of Purifics, Tony Powell, agreed to come from Canada and visit the pilot at the Clinton Street Plant. His visit had been long delayed due to COVID-19 restrictions in Canada. During the second week of September Mr. Powell spent time at the site evaluating the pilot. He added more titanium to the slurry, ran DO through the AOP to clean the quartz sleeves, and added caustic to the water before it entered the CUF to aid in the removal of iron. Water from the south basin and well 3R were run through the pilot. Unfortunately, the results were still above the MCL for 1,4 Dioxane, thus the Village of Hempstead will no longer pursue testing with the Purifics system for AOP treatment, although Purifics has agreed to leave the pilot unit at Clinton Street for the next several months for further research.

A positive outcome from the Purifics AOP pilot was the successful removal of iron with the CUF. Because the Village has high concentrations of iron it is in dire need of an iron removal facility. With the encouraging results of the CUF from the AOP pilot the Village is preparing for an iron removal pilot study using the Purifics CUF. The use of the CUFs is expected to be less expensive and require less maintenance than manganese green sand filters. The greensand filters also use sodium hypochlorite as an oxidizer for the iron and calcium, and that hypochlorite will be a scavenger for the hydrogen peroxide to be fed as part of the AOP process.

The village has been in discussions with several other AOP vendors to assess options and to hasten the implementation of full scale AOP treatment. Arrangements are being negotiated to send bench scale water sample to APT Water to evaluate their ozone-hydrogen peroxide AOP system.

One other system for which pilot samples were conducted is the “Membro” treatment process manufactured by StreamGo. The StreamGo technology uses a Titanium Oxide membrane with an electrical current and ozone to oxidize 1,4 Dioxane. The membrane sheets are easily cleaned and are highly resistant to fouling.

The manufacturer is currently treating preliminary samples at a pilot unit located in Bellport using water provided by the Village. Results have not yet been received, but are due in the near future. If these results are promising a separate pilot proposal will be submitted to NCDOH and NYSDOH for consideration.

The Village is currently making arrangements to begin testing with the Trojan Technologies pilot system using UV/H₂O₂ and a pilot sampling plan is being prepared. It is likely that the iron and calcium deposition will adversely impact that system as well so only the lower iron wells will be utilized. Use of the Purifics CUF in line with the Trojan AOP system may also be possible at this time. A second round of pilot testing using the Trojan system is also being planned for the Laurel Avenue Plant. That pilot would use water effluent from the existing iron removal filters

and AST so would be more similar to future water quality from the Clinton Street wells should a conventional manganese greensand filter unit be constructed at Clinton Street.

The Village is continuing to pursue alternate supply options. There are very few empty parcels of any size remaining within the village boundaries. The Clinton Street water plant is located in the northern part of the village and has been impacted with poor water quality associated with the Roosevelt Field groundwater plume for many decades. The regional groundwater flow direction within the aquifers is from a bit east of north to just west of south, although this is greatly impacted by high volume water pumping for the potable supply.

The Laurel Avenue water plant is located in the southern portion of the village. The two wells there have trace levels of Freon refrigerant but no other VOCs. They are also impacted by 1,4 Dioxane but at much lower concentrations than at Clinton Street. It is believed that any new wells located in the southern portion of the village will have better water quality as other water suppliers to the south are not yet impacted by 1,4 Dioxane.

A third water plant has been planned for decades to be collocated with Kennedy Park in the southeastern part of the Village. The Village made application to the New York State Department of Environmental Conservation (NYSDEC) for two 1,500 gpm wells at Kennedy Park and was issued permits. These wells would have some impact on the park as it is not very large and is fully utilized. If future treatment changes were required an even larger impact would result. The Village identified a slice of unused land at the High School, near the southwest village boundary, as perhaps the only other suitable parcel for well construction. Negotiations with the School District commenced several years ago and have finally resulted in permission to drill two test wells.

These new well permits have previously been approved at Kennedy Park. The engineering report and permit applications have been updated to reflect Hempstead High School as the new water plant location. We are in the process of submitting the revised engineering report and permit applications to the NYSDEC to transfer the well permits from Kennedy Park to the Hempstead High School. A similar application is being prepared for submission to NCDOH for approval of the test wells and permanent wells, and plans and specifications for the well work are complete and will be bid upon receipt of approval.

Preparation of permit applications and engineering report for the blending of well water is underway. The Village is blending the well water to reduce the levels of 1,4 Dioxane in the delivered water until AOP treatment can be fully implemented.

Condition 3

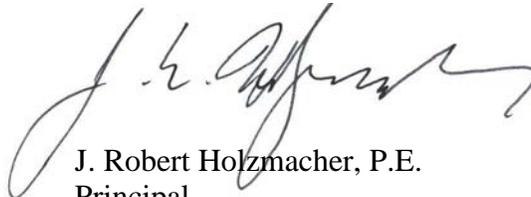
Condition 3 required documentation if exposure mitigation measures cannot be implemented. Currently the Village of Hempstead is in compliance with the exposure minimization measures stipulated in the deferral application. These include deferring use of wells having higher concentrations of 1,4 Dioxane and mixing the water from the wells with elevated concentrations

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of 1,4 Dioxane with wells that have lower levels of 1,4 Dioxane. Trace concentrations of 1,4 Dioxane are present in the water distributed to the residents since seven out of the nine wells have levels of 1,4 Dioxane above the MCL. It is impossible for the Village to distribute water to their residents below the MCL without at least one full scale AOP treatment unit in operation because the water demand is high and cannot be met with only two wells. The Village is working as quickly as they can to find the most suitable AOP treatment units to implement at the water treatment plants and to bring alternate sources of water supply on line.

Please call me if you have any questions or comments.

Sincerely,
J. R. Holzmacher, P.E., LLC



J. Robert Holzmacher, P.E.
Principal

JRH/sc

Encl.

CC: Mike Taylor, Supervisor
Steve Giardino, Assistant Supervisor

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