Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

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September 21, 2021

Mr. Neal Merritt, Deputy Superintendent
Hanover Department of Public Works
40 Pond Street
Hanover, MA 02339

RE: HANOVER – Public Water Supply
Hanover Department of Public Works
PWS ID#: 4122000
Granular Activated Carbon Filter
BRP WS 21D, Approval to Conduct
Pilot Study > 1 MGD
Transmittal No.: X288372
BRP WS25D, Treatment Facility
Modification > 1 MGD
Transmittal No.: X288373

Dear Mr. Merritt:

Attached please find an approval to replace the sand and gravel media with granular activated carbon (GAC) in one of the three filters at the Pond Street Water Treatment Plant in the Town of Hanover, Massachusetts. The attached document also approves the Hanover Department of Public Works to conduct a pilot study for removing per- and poly-fluoroalkyl substances (PFAS) from the raw water.

The signature on this cover letter indicates formal issuance of the attached document. If you have any questions concerning this document, please contact me via phone at (508) 946-2805 or via email at james.m.mclaughlin@mass.gov .

Sincerely,

Jim McLaughlin, Chief
Drinking Water Program
Bureau of Water Resources

JM/encl.
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Hanover Department of Public Works
Hanover, Massachusetts
PWS ID #4122000
Granular Activated Carbon Filter Pilot Study to Remove Perfluorinated Compounds
BRP WS 21D, Approval to Conduct Pilot Study > 1 MGD
Transmittal No.: X288372
BRP WS25D, Treatment Facility Modification > 1 MGD
Transmittal No. X288373

The Massachusetts Department of Environmental Protection ("the Department") has received and reviewed applications from the Town of Hanover Department of Public Works ("the PWS") to replace a multi-media filter with a granular activated carbon (GAC) filter at its Pond Street Water Treatment Plant, Department Identification Number 4122000-01T, and to conduct a study to determine the GAC filter's effectiveness for removing per- and poly-fluoroalkyl substances (PFAS). The treatment facility is located off Route 53 in Hanover, Massachusetts. The application was prepared and submitted on behalf of the PWS by its consultant, Environmental Partners, over the seal and signature of Mr. Eric A. Kelley, Massachusetts Registered Professional Engineer, P.E. No. 48090 ("the Engineer"). The Department received the applications via email on September 17, 2021, with an update received via email on September 21, 2021 following the Department's initial review comments.

The permit application package includes the following:

- Transmittal Forms for Permit Application and Payment, #X288372 & X288373;
- BRP WS21D, Approval to Conduct Pilot Study > 1 MGD;
- BRP WS25D, Treatment Facility Modifications > 1 MGD;
- Process Flow Diagram;
- Letter Report by the Engineer, dated September 17, 2021;
- CalgonCarbon Filtrasorb® 300 data sheet;
- Filter Media existing and proposed cross sections;
- Updated submittal emailed on September 21, 2021.

PROJECT PURPOSE AND BACKGROUND

Hanover's Pond Street Water Treatment Plant ("the plant") provides conventional surface water treatment to water drawn from the three Pond Street Wells, Department Source Identification Numbers 4122000-01G, -05G, and -08G. The plant is one of three water treatment plants supplying water to the Town of Hanover and is the major source of water supply. The three Pond Street wells are treated at the Pond Street WTP (4122000-01T) including pre-filtration pH adjustment with lime, oxidation with potassium permanganate (KMnO4), polymer addition, coagulation with aluminum sulfate (alum), flocculation, sedimentation, filtration, post-filtration pH adjustment with potassium hydroxide (KOH), 4-log disinfection with sodium hypochlorite (NaOCl), and chloramination with ammonium sulfate. Four-log virus inactivation under the Groundwater Rule is achieved by post-filter chlorination and contact time in a baffled clearwell. The plant is rated at a 3-T operations level. Recent testing of the plant's finished water has revealed the combination of six (6) per- and poly-fluoroalkyl substances (PFAS) levels is above the Department's current Office of Research

and Standards Guideline (ORSG) and proposed Maximum Contaminant Level (MCL) of 20 ppt (0.02 µg/l). Plant results reported in the application are approximately 36 ppt.

GAC is widely used to meet the requirements of the Surface Water Treatment Rules and to remove PFAS. Note that the Pond Street wells are classified as groundwater and compliance with the Surface Water Treatment Rules is not required at the plant. The PWS is requesting to remove the sand filter media from one of its three filters and install 30-inches of GAC over 6-inches of filter sand in order to conduct a four-week demonstration study of the GAC's effectiveness to remove PFAS. The GAC will be CalgonCarbon Filtrasorb® 300. The existing filters consist of 18-inches of anthracite over 12-inches of sand. Each filter is 13-feet by 12-feet with a surface area of 156 square feet. The change in filter media will not impact the existing 4-log virus inactivation achieved by the post-filtration disinfection and clearwell contact time.

An important factor in removing PFAS with GAC is the empty bed contact time (EBCT). Generally, the EBCT for GAC should be 10 minutes to provide enough contact time to adequately remove the PFAS. The plant has a design hydraulic capacity of 2.1 million gallons per day (MGD), an average annual flow rate of 1.0 MGD, and a peak rate in the past year of 1.3 MGD, as presented in the application. The Engineer states that "more than 95% of the time the plant is operating around 1 MGD." The Department has tabulated the EBCT's given in the application below. Typical operations appear to allow an EBCT at 10 minutes or greater; however, the EBCT will drop off during backwash. The demonstration study report will need to describe backwash timing, and if it's possible to backwash during lower-demand times of day. Given the urgency to remove PFAS, considered to be an acute contaminant, the Department is permitting this installation and study to move forward with what appears to be less than ideal design parameters. The proposed alternative is the most rapid option for providing compliant water to Hanover residents. The pilot study report will need to address the Department's concerns regarding EBCT.

Table 1: Empty Bed Contact Time Given Flow Rate and Active Filters

Flow Rate (MGD)	EBCT (min) with 3 filters online	EBCT (min) with 2 filters online
1.0	12.6	8.4
1.3	9.7	6.5

PER- AND POLYFLUOROALKYL COMPOUNDS

On October 2, 2020, the Department published final regulations establishing a drinking water standard, or a Maximum Contaminant Level (MCL), for the sum of six per- and polyfluoroalkyl substances (PFAS). The MCL is 20 parts per trillion (ppt) for what the regulations call PFAS6, or the sum of six PFAS compounds: perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorohexane sulfonic acid (PFHxS), perfluorononanoic acid (PFNA), perfluoroheptanoic acid (PFHpA), and perfluorodecanoic acid (PFDA). PFAS Drinking Water Regulations require all public water supplies to collect baseline PFAS samples and take other actions if results exceed the MCL. For information and technical support documents see: https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas#health-advisories-and-downloadable-fact-sheets- .

PROPOSED DEMONSTRATION STUDY

All water quality samples will be collected by Hanover treatment plant operations staff. All water quality testing, except for PFAS and total organic carbon (TOC), will be performed using Hanover's existing bench-top equipment located at their Great Pond WTP water quality laboratory and using existing on-line turbidimeters. PFAS (USEPA Method 537.1) and TOC analysis will be performed by an independent certified laboratory. Water quality sampling frequencies are shown in Table 2 reproduced from the submitted application and modified by the Engineer via an email dated August 18, 2020.

Table 3 (reproduced from application): Water quality Sampling Frequency

PARAMETER	SAMPLING INTERVAL
Turbidity	Test Filter and CFE: continuous Monitoring and Grab Samples every 2 hours
pH	Test Filter and CFE: Grab Samples every 4 hours
Alkalinity	Test Filter and CFE: daily grab sample (every 24 hours)
PFAS	Raw, Test Filter and Finished Water: weekly (Test Days 7, 14, 21, and 28)
UV-254	Settled Water, Test Filter, and CFE: daily grab samples (every 24 hours)
Total Organic Carbon (TOC)	Settled Water, Test Filter, and CFE: weekly (Test Days 7, 14, 21, and 28)

Following the completion of the four-week study period, the Engineer will submit BRP WS22, Pilot Study Report to the Department for its review. The PWS requests to leave the GAC filter in service following the study period provided the filter is attaining compliant results. Following successful performance during the study period, and upon Department review and approval of the Pilot Study Report, the PWS intends to submit an application to replace the media in its remaining two filters with GAC. Following pilot study completion, the Department will require monthly PFAS sampling of the finished water entering distribution.

SIMULTANEOUS COMPLIANCE

Any change in treatment must be evaluated for potential impacts on compliance with water quality regulatory requirements. In addition to sampling at the treatment plant, the PWS will sample the entry point and ten (10) distribution system sample sites for pH, alkalinity, calcium, chloride and sulfate.

APPROVAL CONDITIONS

Pursuant to the Department's authority under 310 CMR 22.04(7) to require that each supplier of water operate and maintain its system in a manner that ensures the delivery of safe drinking water to consumers, this approval is made subject to the following conditions:

1. All submittals required by this approval shall be directed to the Department's Southeast

Regional Office Drinking Water Program unless otherwise specified. All submittals required by this approval shall reference the date of this approval letter and Transmittal Numbers X288372 and X288373.

2. The PWS must establish its applicable Optimum Water Quality Parameters (OWQP) to comply with the Lead and Copper Rule (LCR) (310 CMR 22.06B). To accomplish this, the PWS will need to collect water quality samples from the finished water sample line, all other entry points (i.e., sample the source water; post-treatment if treatment is used), and from sites in the distribution system which represent water quality throughout the distribution system (e.g., coliform sampling sites). The number of distribution sites to be sampled is based upon the population served:

System Population Served	**No. Water Quality Sites**	**System Population Served**	**No. Water Quality Sites**
>100,000	25	3,301-10,000	3
50,001-100,000	10	501-3,300	2
10,001-50,000	10	Less than or equal to 500	1

The number of water quality data sets required to be collected are dependent on the complexity and size of the water system. Entry point sampling is conducted every other week. Distribution system sampling sites can be at Lead and Copper Rule sampling locations or at Revised Total Coliform Rule sampling locations. The water quality parameters to be analyzed include: pH, alkalinity, conductivity, calcium, temperature, orthophosphate (if a phosphate inhibitor is used), and silica (if a silica based inhibitor is used). Water quality data shall be reported to the Department on Form LCR-WQP. Please contact Giliane Tardieu of the Southeast Regional Office at 508-946-2789 to determine sampling locations and distribution system sampling frequency.

3. The PWS shall maintain the pH of the finished water (point of distribution system entry) at a level consistent with their corrosion control strategy.

4. The PWS shall maintain compliance with all requirements of the Groundwater Rule and the Disinfection By-Product Rules, including mandatory reporting and notification requirements.

5. The PWS shall discuss the GAC filter performance with the Department's compliance staff following the four-week pilot study. The GAC filter may remain online provided it maintains compliance with the Surface Water Treatment Rules and Disinfection By-Product Rules.

6. The BRP WS22 Pilot Study Report shall be submitted to the Department within sixty (60) days of completing the study.

7. All Granular Activated Carbon used in the filters shall be NSF-certified for contact with potable water.

8. The PWS shall update its Operation and Maintenance (O&M) manual, including a spare parts list and parts order form, and Emergency Response Plan to include the new filter media.

9. Based on the pilot study results and ongoing monthly PFAS monitoring, the PWS will include in its O&M manual procedures for carbon filer media replacement to ensure that adequate PFAS removal from water entering distribution is reliably and consistently obtained. The consistency, reliability, and adequacy of O&M procedures at assuring carbon filter media performance and replacement will be the basis for setting a long-term PFAS sampling schedule after 12 months of monthly sampling.

10. The PWS shall update its Waste Disposal Plan including its Residuals Management Plan.

11. The PWS shall notify the Department in writing prior to any application to its reservoir of algaecides containing copper in accordance with the Department's Drinking Water Regulations at 310 CMR 22.20B(8).

12. The PWS shall notify the Department by email the day the GAC filter is activated.

13. The PWS shall submit a new BRP WS25D Treatment Facility Modification > 1 MGD to propose installing GAC media in the remaining filters following successful demonstration of the GAC to both comply with the Surface Water Treatment Rule requirements and for removing PFAS.

14. Prior to activating the GAC filter, a Massachusetts Registered Professional Engineer shall submit a stamped certification of the completed works. The certification shall be accompanied by the following:

    a. A statement certifying that the facilities have been constructed in accordance with the permit application, and are in compliance with the Department's regulations, guidance, policies, and this approval.
    b. A statement that the facilities are fully operational, tested and ready to be put on-line.
    c. A description of the GAC installed and an attestation that the GAC is NSF approved.

The proposed project was not required to be reviewed under the Massachusetts Environmental Policy Act (MEPA).

Both the Administrative and Technical Reviews of the following applications have been completed: BRP WS 21D, Approval to Conduct Pilot Study > 1 MGD, Transmittal No.: X288372, and BRP WS25D, Treatment Facility Modification > 1 MGD, Transmittal No.: X288373. This approval pertains only to the water supply aspects of the proposal and therefore does not negate the responsibility of the owners or operators to comply with other applicable laws, and/or regulations.