The State of New Hampshire
Department of Environmental Services

Robert R. Scott, Commissioner

November 16, 2018 *Via email to: McCarthyM@wseinc.com*

Ms. Margaret McCarthy, PE
Weston & Sampson
5 Centennial Drive
Peabody, MA 01960

Subject: **PWS 1951020 – Pease Trade Port**
DR 5210 – Grafton Road Drinking Water Treatment Plant (WTP)

Dear Ms. McCarthy:

This confirms our approval, with conditions, of the referenced treatment per your submittal received August 3, 2018, along with the proposed follow-up sampling schedule received September 28, 2018 and the revised Startup and Testing specification section received October 24, 2018. The proposed treatment for all wells using ion exchange and carbon filtration for the removal of per- and polyfluoroalkyl substances (PFAS) contamination is summarized as follows:

Water Source(s)

- 001 GPW Smith /2200' S of TP
- 009 GPW /Harrison Replacement Well
- 002 GPW Haven /5200' NW of TP (currently inactive)

Raw water quality (as presented in Contract Documents):
Fe 0.2 ppm, Mn 0.3 ppm, pH 7.4, PFAS levels:

PFAS Compound	**Harrison Well (ppb)**	**Smith Well (ppb)**	**Haven Well (ppb)**
PFBS	ND	ND	0.041
PFBA	0.010	ND	0.073
PFPeA	0.018	0.010	0.260
PFHpS	ND	ND	0.050
PFHpA	0.009	ND	0.125
PFHxS	0.045	0.037	0.820
PFHxA	0.018	0.012	0.295
PFNA	ND	ND	0.018
PFOS	0.026	0.017	1.200
PFOA	0.016	0.009	0.300
6:2 FTS	ND	ND	0.220
8:2 FTS	ND	ND	0.034

<table>
<tr><td>Design Flow</td><td>
<table>
<tr><th>Source</th><th>Flow (gpm)</th></tr>
<tr><td>Harrison Well</td><td>286</td></tr>
<tr><td>Smith Well</td><td>343</td></tr>
<tr><td>Haven Well</td><td>534</td></tr>
<tr><td>Water Treatment Plant (WTP)</td><td>1200</td></tr>
</table>
</td></tr>
<tr><td>Chemical Treatment Description</td><td>
<table>
<tr><th>Chemical Name</th><th>Bulk Storage (gal)</th><th>Day Storage (gal)</th><th>Pump (gph)</th></tr>
<tr><td>Hydrofluorosilicic Acid*</td><td>70</td><td>10</td><td>0.3</td></tr>
<tr><td>Sodium Hypochlorite</td><td>325</td><td>30</td><td>2</td></tr>
<tr><td>Ortho/Polyphosphate</td><td>70</td><td>10</td><td>0.3</td></tr>
</table>
* - Hydrofluorosilicic Acid will be replaced with sodium fluoride prior to construction.
</td></tr>
<tr><td>Filtration Description (In order of treatment)</td><td>
1. Cartridge Filters (Fe, Mn, and particulate reduction) – 4 x 20” diameter x 63.5” tall rated for 235 psi and 300 gpm each, 3 cartridges in each vessel, 10 micron openings, all supplied by Harmsco Filtration Products.
2. Resin Filters (PFAS reduction) – 12 x 6’ diameter x 10’ tall vessels rated for 165 psi working pressure and 170-200 gpm each, lead lag piping manifold, 152 cu ft ECT2 Sorbix LC1 ion exchange resin each, 5 minute EBCT, all supplied by ECT2.
Sample taps: inlet, 50% filter point, outlet (each vessel)
3. GAC Filters (PFAS reduction) – 3 x 10’ diameter x 10’ tall vessels rated for 165 psi working pressure and 400 gpm each, lead lag piping manifold, 20,000 pounds Filtrasorb 400 media each, 10 minutes EBCT, all supplied by Calgon Carbon.
Sample taps: inlet, 50% filter point, outlet (each vessel)
</td></tr>
<tr><td>Process Pumping Equipment</td><td>
002 GPW Haven Well Vertical Turbine:
HVN_100: 534 gpm @ 257 ft and 65% efficiency
Centrifugal Pumps:
Recycle, PES_RCP-711/721: 177 gpm @ 350 ft
Residuals, PES_RES-712/722: 50gpm @ 76 ft
Booster, PES_PBP_602: 600 gpm @ 125 ft
Skid mounted – Raw water booster pumps, P-1/2/3: 400 @ 460 ft
</td></tr>
<tr><td>Onsite Storage</td><td>
No finished water storage onsite.
Two (2) Interconnected Backwash Basins / Recycle Tanks:
24,000 gallons each (approximate)
</td></tr>
<tr><td>Waste Disposal / Discharge Registration</td><td>
Connection to sewer, or alternatively to a hauling truck.
Startup water will be discharged according to an approved plan submitted by the Contractor.
</td></tr>
</table>

Sampling Requirements	See attached sampling plan. Upon activation of the Haven Well: Reset lead and copper sampling plan. Six (6) consecutive months of RAW water Investigative Monitoring (IM) samples for *E.coli* from the Haven Well source (enclosed IM form to be returned to this office).
Safety Equipment	Personal chemical safety equipment (gloves, goggles, etc.). Emergency showers and eyewash stations.
Emergency Power	A standby generator connected to a buried natural gas feed line.

This approval is subject to:

1. Submittal of electronic copies of **As-Bid Plans and Specifications** to this department prior to the bid opening, at the latest.
2. Approval of any changes to the submitted 90% design, including any addenda issued during the bid process.
3. Compliance with all construction requirements per Env-Dw 404 *Design Standards for Large Public Water Systems*.
4. **DES site inspection** prior to water treatment plant startup.
5. Submittal of an updated **Water System Emergency Plan** per Env-Dw 503.21 *Emergency Plans for Community Water Systems.*
6. Contract of a **Primary Operator** with a minimum **Grade 2 certification** for treatment and distribution operations.
7. The certified, or delegated operator must, at a minimum, perform daily inspections at the WTP.
8. Submittal of electronic copies of final **Record Drawings** to this department, and maintenance of copies on file by the water system owner.
9. Preparation of a final **O&M Manual** and maintenance of copy on file by the water system owner. Water system copies of the O&M manual and Record Drawings shall be available for review during DES site inspections, when requested.
10. Submittal of a plan for final disposal of **spent resin and carbon media**.
11. Submit for approval all water quality results included in the specifications.
12. Sampling is required in accordance with the attached sampling plan for startup and continuous monitoring. DES reserves the right to either remove or add additional PFAS analytes to this list upon the receipt and consideration of any new information or regulation. DES is currently in the process of reviewing PFAS contamination and is preparing to set new maximum contaminant levels (MCLs) in the near future. It is anticipated that MCLs will be set for PFOA, PFAS, PFHxS and PFNA prior to the WTP going online. The WTP shall be designed and operated to reduce all four regulated PFAS analytes to non-detect levels, as expected from the proposed Best Technology Available. Non-detect levels are required based on review of the pilot data and the very quick spike in filtered water levels once breakthrough occurs. This was evident in all four of the future regulatory contaminants, and especially PFOS and PFNA.
    As stated in the attached sampling plan, continuous monitoring will be required during the first year of operation and at that time, sampling requirements will be reevaluated.

General Comments/Recommendations:

1. According to specification, the membrane waterproofing is not being applied to basin walls on the building's interior. Since this a recycle tank, any interior repair or leak prevention product must be approved for use in drinking water.
2. The plumbing systems have color coding that are the same as some of the chemical piping colors. This should be coordinated and avoided.
3. Hydrant drains should be plugged if located within the high ground water table. Information on ground water levels shall be provided to this office levels if drain plugs are not to be installed.
4. It was unclear during this review what pipe material is to be used inside the WTP. Ductile Iron, PVC, and HDPE are all acceptable materials, and can be selected by the owner of the system/
5. Communications failure at this WTP should be an alarm called out from the main PLC at the Madbury WTP since there is no backup PLC specified.
6. Standard operating procedures (SOPs) should be established for many operations including, but not limited to, chemical deliveries, storage and startup of filters that are in not in operation, recycling of wash water, pumping to sewer, bag filter replacement, resin exchange, carbon exchange, pumping to waste, and pumping wells to waste.
7. It appears that the Filter to Waste is only piped to one Backwash Recycle Basins. If so, a SOPs should be established for shutting down one tank for maintenance.
8. The raw water booster pumps are designed for 460 feet of total dynamic head (200 psi) but the resin and GAC filter vessels are only rated for 165 psi. At a minimum, the VFD programming should be programmed to avoid over pressurization of the vessels.
9. The specification should consider adding PFHxS and PFNA to the operational requirements listed for the resin media, as these are expected to be included in the state's regulations prior to the WTP going online.
10. VOC testing shall be per Env-Dw 705.01, not 22.07B(1), 22.07C(5) as specified.
11. The installation of motion detectors in the lab was discussed at a previous meeting since there are no intrusion devices on the exterior windows in this room. There are also no intrusion alarms noted on the drawings for the Harrison and Smith Wells, although these may be existing. Security of the drinking water sources should be reviewed.
12. Per subsequent discussions with the engineer after receiving the review documents, a change from Hydrofluorosilicic acid to sodium fluoride is being incorporated into the design. DES will confirm compliance with regulations when the requested as-bid documents are received. As a general note, we recommend that the dry chemical for this treatment application be researched to confirm NSF 60 approval and free from any impurities. Products made in the USA are recommended.

Please contact me at (603) 271-1746 or Randal.Suozzo@des.nh.gov for any questions regarding this letter.

Sincerely,

Randal A. Suozzo, PE
Drinking Water & Groundwater Bureau

ec. Brian Goetz, Terry Desmarais, Al Pratt, City of Portsmouth
Kyle Hay, Blake Martin, Weston and Sampson
Rick Skarinka, NHDES

Enclosures: Sampling Plan, GWR-IM form

5 Centennial Drive, Peabody, MA 01960 (HQ)
Tel: 978.532.1900

Grafton Road DWTP Sampling Recommendations

September 28, 2018

Compliance Monitoring

Compliance samples are collected from the finished water sample line using either an online analyzer, and recorded through SCADA, or as a grab sample. It is recommended that PFAS sample results be reported to NH DES quarterly.

Table 1 – Finished Water Sample Tap Compliance Monitoring

pH	Online Analyzer
Chlorine Residual	Online Analyzer
Fluoride	Online Analyzer
PFAS (PFOA, PFOS, PFNA, & PFHxS)	Grab Samples*

* Grab samples should be collected weekly for four weeks after the startup of new treatment equipment. These startup milestones include: startup of the Phase 1 GAC system, startup of the resin system on Harrison and Smith Well water, and startup of the Haven Well. Outside of these four-week startup periods, PFAS samples should be collected monthly for the first year after the full system is operational. After a year, the sampling requirements should be reevaluated for the potential of reduced monitoring.

Performance Monitoring

PFAS performance sampling is detailed below in two categories, startup monitoring and continuous monitoring.

Startup Monitoring

Performance monitoring during milestone startups should occur weekly for four weeks (or until water conditions stabilize). These milestones include: startup of the Phase 1 GAC system, startup of the resin system on Harrison and Smith Well water, and startup of the Haven Well. Samples collected during these sampling events should be analyzed for 23 PFAS compounds.

Table 2 – PFAS Sampling during Milestone Startups

Startup Milestone	Sampling Location
Phase 1 GAC Startup	Influent GAC effluent*
Resin Startup with Harrison and Smith Wells	Influent Resin-1 effluent* Resin-2 effluent* GAC effluent*
Startup of Haven Well	Influent Resin-1 effluent* Resin-2 effluent* GAC effluent*

*Filter effluent samples shall be collected from each filter that was in service during the prior week.

Continuous Monitoring

Continuous monitoring shall begin roughly one month after each milestone startup. Samples should be collected monthly for the first year. After a year, the sampling schedule may be reviewed and reduced monitoring may be acceptable. Samples collected during these sampling events should be analyzed for 23 PFAS compounds. Figure 1 shows a Gantt chart with approximate PFAS sampling dates based on the anticipated construction schedule.

Table 3 – PFAS Sampling for Continuous Monitoring

Continuous Monitoring	Influent Resin-1 effluent* Resin-2 effluent* GAC effluent*

* Filter effluent samples shall be collected from each filter that was in service during the prior month.

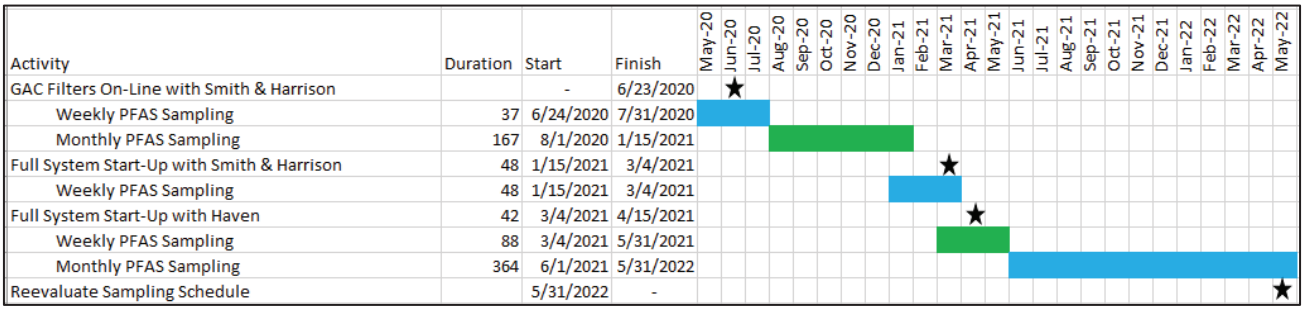

Figure 1 – PFAS Sampling Schedule

Other Monitoring

Other online analyzers that will aid in the tracking of treatment performance are pH (raw and combined GAC effluent) and turbidity (combined GAC effluent).