



## Texas Commission on Environmental Quality

*Protecting Texas by Reducing and Preventing Pollution*

January 3, 2019

Mr. Cris Lemay, Product/Applications Manager  
Graver Technologies  
200 Lake Drive  
Glasgow, DE 19702

Re: Challenge Test Approval for the Removal of Microbial Contaminants  
Graver Technologies QCR™ II Series Filter Cartridges  
Graver Technologies GLP™ Series Multi-Cartridge Filter Housings

Dear Mr. Lemay:

On May 17, 2018, the Texas Commission on Environmental Quality (TCEQ) received your request, in a letter dated May 17, 2018, to include the Graver Technologies GLP™ Series cartridge filter housings in lieu of the previously approved LPF Series cartridge filter housing. On April 18, 2018, the TCEQ approved the use of Graver QCR™ II Series filter cartridges with Graver Technologies LPF Series multi-cartridge filter housings for microbiological treatment for use by public water systems in the State of Texas. Based on our review, we are **approving** the Graver QCR™ II Series filter cartridges with Graver Technologies GLP™ Series cartridge filter housings for microbiological treatment for use by public water systems in the State of Texas. Additional information in support of this approval was received in e-mails on November 20 and 26, 2018 from Mr. George Fuller of Graver Technologies.

### **GRAVER TECHNOLOGIES GLP™ SERIES MULTI-CARTRIDGE FILTER HOUSINGS**

Challenge studies for cartridge filters are reviewed in accordance with 40 Code of Federal Regulations (40 CFR) §141.719(a) and Title 30 of the Texas Administrative Code (30 TAC) §290.42(g)(2). The requirement specified in 40 CFR §141.719(a)(2) states that "challenge testing must be performed on full-scale bag or cartridge filters, and the associated filter housing or pressure vessel, that are identical in material and construction to the filters and housings the system will use for removal of *Cryptosporidium*." In addition, 40 CFR §141.719(a)(10) states that "if a previously tested filter is modified in a manner that could change the removal efficiency of the filter product line, challenge testing to demonstrate the removal efficiency of the modified filter must be conducted and submitted to the State."

Both the GLP™ Series and the LPF Series multi-cartridge filter housings use the same double O-ring interface between the cartridge and the vessel that is referred to as 222. According to your submittal, this interface has been generally accepted as an industry standard design. The former LPF and current GLP™ Series vessels are both constructed using industry standard dimensional pipe. Your recent November 20, 2018 e-mail provided information stating that the two series have slight variations in height and width, and the inlet/outlet connection location and design may vary depending on the design of the system. Both 304 and 316 stainless steel used in the LPF and the GLP™ Series vessels comply with Annex C, Acceptable Materials, of the NSF (NSF International)/ANSI (American National Standards Institute) Standard 61.



We have determined the differences between the previously approved Graver Technologies LPF Series multi-cartridge filter housings (used for the challenge study approved by the TCEQ on April 18, 2018) and the Graver Technologies GLP™ Series cartridge filter housings are not significant in way that would affect the removal of *Cryptosporidium*. Therefore, we are accepting the GLP™ Series cartridge filter housings in addition to the previously approved LPF Series multi-cartridge filter housings for microbiological treatment when used with the Graver QCR™ II Series filter cartridges.

**CHALLENGE TESTING REQUIREMENTS**

Bag or cartridge filters must be challenge tested in the same configuration that the system will use, either as individual filters or as a series configuration of filters. Individual replacement Graver QCR™ II Series filter cartridges can be identified by the following part number:

QCR 0.8-XXYYY      QCR= Cartridge Type; 0.8 = Micron; XX = Length; YYY- End Configuration Code

Challenge studies for cartridge filters are reviewed in accordance with 40 CFR §141.719(a) and 30 TAC §290.42(g)(2). As allowed by 40 CFR §141.719, the TCEQ can grant up to 2.0-log *Cryptosporidium* removal credit for individual bag and cartridge filters. This regulation also requires a factor of safety of 1.0-log applied to challenge testing results to determine removal credit.

**APPROVED CHALLENGE STUDY**

The TCEQ has reviewed the challenge test data for the proposed Graver QCR™ II cartridge filters using the Model LPF03R1-N2-U-VBEIPTGPX cartridge housing. The challenge tests were conducted by IBR Laboratories in a report to the manufacturer dated September 21, 2017. The following table is provided for your reference in regard to removal credits granted based on the source water's Bin classification (refer to 40 CFR §141.710).

<b>TCEQ Graver QCR™ II Cartridge Filter Granted Removal Credits</b>			
<b>Bin &amp; Configuration</b>	<b><i>Crypto</i></b>	<b><i>Giardia</i></b>	<b>Viruses</b>
Bin 1 Individual	2.0-log	3.0-log	0.0
Bin 1 Series	2.0-log	3.0-log	0.0
Bin 2, 3, 4 Individual	2.0-log	3.4-log	0.0
Bin 2, 3, 4 Series	2.0-log	3.4-log for each filter but no more than 7.3-log for two in series	0.0

The above removal credits for *Cryptosporidium* oocysts and *Giardia lamblia* cysts were based on:

- 1) For public water systems assigned a Bin 1 classification, based on the occurrence of *Cryptosporidium* oocysts in their raw water sources, the minimum required removal for *Cryptosporidium* oocysts is 2.0-log and 3.0-log inactivation and/or removal for *Giardia lamblia* cysts. The Graver QCR™ II Series filter cartridges with Graver Technologies LPF Series multi-cartridge filter housing demonstrated 3.88-log removal with a 2.0-micron polystyrene microsphere surrogate for *Cryptosporidium* oocysts and 3.11-log removal with a 1.0-micron polystyrene microsphere surrogate for *Cryptosporidium* oocysts. Applying a 1.0-log safety factor, in accordance with 40 CFR §141.719(a)(1) for individually tested bag or cartridge filters, the challenge test results demonstrate that the Graver QCR™ II Series filter cartridges have a removal credit that is greater than is required for *Cryptosporidium* oocysts for public water systems assigned a Bin 1 classification.
- 2) For public water systems assigned either a Bin 2, 3, or 4 classification, based on the occurrence of *Cryptosporidium* oocysts in their raw water sources, please be advised that the 2.0-log removal credit was granted because:
  - a. Although a greater inactivation and/or removal credit is required for *Cryptosporidium* oocysts, 40 CFR §141.719(a) only allows up to 2.0-log removal credit be granted for



individually tested cartridge filters; and

- b. The Graver QCR™ II Series filter cartridge was not challenge tested in series, thus cannot receive the 2.5-log removal credit allowed by 40 CFR §141.719(a) for cartridge filters challenge tested in series.
- 3) Please note that the federal rules do not address the inactivation and or removal of *Giardia lamblia* cysts at public water systems assigned Bin 1, 2, 3, or 4 classifications (based on the occurrence of *Cryptosporidium* oocysts in their raw water sources). However, when cartridge filters are used for the removal of *Giardia lamblia* cysts, the TCEQ has chosen to apply a safety factor of 0.5-log to:
- a. The demonstrated log removal value for the filter ( $LRV_{\text{filter}}$ ) for a single cartridge filter installed individually using a 2.0-micron spherical polystyrene challenge surrogate;
  - b. The sum of two, or more, individually challenged cartridge filters installed in series; and
  - c. The demonstrated log removal for series challenged cartridge filters.

#### TCEQ-APPROVED REMOVAL CREDIT APPLICABILITY

The above removal credits are **only** applicable to:

- 1) The submitted Graver QCR™ II Series filter cartridges and not any other Graver models or variations of this QCR™ II Series model.
- 2) The Graver QCR™ II Series filter cartridges without any modifications or changes to the design or construction. Graver Technologies must notify the TCEQ in writing if the Graver QCR™ II Series filter cartridges, as challenge tested by IBR Laboratories, are modified in any manner. After receiving written notification, the TCEQ will determine if the modified Graver QCR™ II Series filter cartridge shall be required to undergo a new challenge study.
- 3) Graver QCR™ II Series filter cartridges operated:
  - a. At a pressure drop of no greater than 36 pounds per square-inch (psi) differential pressure (DP);
  - b. At a flow rate no greater than 7 gallons per minute per 10-inch length filter; and
  - c. In a Graver Technologies LPF Series or GLP™ Series multi-cartridge filter housing.
- 4) All cartridge filters and O-rings must be intact, and the integrity of the cartridge cannot be compromised to receive the removal credit.
- 5) For the current Federal and state statute and rules.

#### DOCUMENTATION WITH THE SUBMITTAL

- Single-pass challenge studies were conducted on one Graver Technologies Model LPF03R1-N2-U-VBEIPTGPX cartridge housing (serial number 130135) with three 10-inch Model QCR™ II filter elements.
- Challenge tests were conducted using both 1.0-micron and 2.0-micron fluorescing polystyrene microspheres as surrogate for *Cryptosporidium* oocysts.
- The filter was challenged with the polystyrene microspheres during three periods over the filtration cycle: near start-up (1 psi DP); when the pressure drop was between 45 and 55 percent of the terminal pressure drop (18 psi); and at the end of the cycle after the pressure drop has reached 100 percent of the terminal pressure drop (36 psi).
- The following log removal values (LRVs) were calculated for the three challenge periods using the 1.0-micron fluorescing polystyrene microspheres:
  - 3.44-log at 1 psi DP



- 3.11-log at 18 psi DP
- 3.93-log at 36 psi DP (terminal pressure)
- The following LRVs were calculated for the three challenge periods using the 2.0-micron fluorescing polystyrene microspheres:
  - 3.88-log at 1 psi DP
  - 3.89-log at 18 psi DP
  - >3.94-log at 36 psi DP (terminal pressure)

#### **DRINKING WATER SYSTEM COMPONENTS – HEALTH EFFECTS**

The TCEQ requires in 30 TAC §290.42(j) that water treatment products used by public water systems must comply with ANSI/NSF Standard 61 for drinking water system components. We use this standard to ensure that harmful levels of contaminants do not migrate or leach from the component's materials into the drinking water. The QCR™ II Series cartridge has not been tested for conformance with the ANSI/NSF Standard 61. However, we have reviewed the supporting documentation provided in your March 13, 2018 e-mail, and we find that the Graver Technologies QCR™ II Series cartridges and the associated housings are suitable for use as drinking water system components for public water systems in Texas. Specifically, we reviewed and accepted the following supporting information that these products will not leach unsafe levels of contaminants into the drinking water:

- Per March 13, 2018 e-mail from Mr. George Fuller of Graver Technologies, there are two materials used in the construction of the Graver Technologies QCR™ II Series cartridge: polypropylene and polyethersulfone (PES).
- August 2, 2016 Test Report and Certificate of Test from IBE-BVI (Belgium Packaging Institute) demonstrating suitability of plastic materials in contact with foodstuffs in accordance with European Regulation 10-2011. The report indicated suitability for the following tested components of Graver Technologies cartridge filters: A.) Cage (FC2210001), B.) Polypropylene supporting material (FM21722902), C.) Silicone O-ring (F755532222), EPDM O-ring (F755562222), E.) QMA/PMA/PMC/QXL/QXR Media (FM2174633), ZTEC Membrane (FM21923400), G.) Water TEC Membrane (FM21923900).
- Quality Certificate/Certificate of Conformance for QCR Filter Elements stating that polypropylene pleated filter (with approximately 7.0 square-feet of surface area) comply with United States Food and Drug Administration (FDA) requirement specified in Title 21 of the Code of Federal Regulations Section 174.5 (General Provisions) and 177.1520 (Olefin Polymers) for Indirect Food Additives.
- Graver Technologies LPF Series and GLP™ Series multi-cartridge housings are constructed of either 304L or 316L stainless steel. Both of these grades of stainless steel are suitable for drinking water applications and are listed in Annex C of ANSI/NSF Standard 61.

#### **ADDITIONAL INFORMATION**

Please provide a copy of this letter to each of your Texas customers and their consulting engineer. For public water systems proposing to use Graver QCR™ II Series filter cartridges for microbiological treatment, the consulting engineer for the project will be required to obtain two exceptions to the minimum water treatment requirements specified in 30 TAC §290.42 prior to the submittal of engineering plans and specifications for the construction of the proposed treatment:



- 30 TAC §290.42(g) - Exception to use innovative/alternate treatment. Because cartridge filters for microbiological treatment do not have minimum design requirements in 30 TAC §290.42, an approved exception is required for the use of this technology. The engineer will not be required to submit pilot data; however, the engineer should include sufficient data for TCEQ to grant a site-specific approval including the water source identification, proposed capacity, make and models of cartridge filters and housings, and details of pre- and post-treatment, if required.
- 30 TAC §290.42(j) - Exception to ANSI/NSF Standard 61 for Drinking Water System Components. Although this letter states that we have reviewed supporting documentation in your submittal indicating that harmful levels of contaminants will not migrate or leach into the treated water, TCEQ rules still require that an exception be reviewed on an individual site-specific basis. Therefore, the consulting engineer for the project must also request an exception to 30 TAC §290.42(j).

Once the exceptions to the above rules have been granted, the engineering plans and specifications must still be approved prior to construction and operation of the treatment. Additional information about the exception process can be found at the following link:

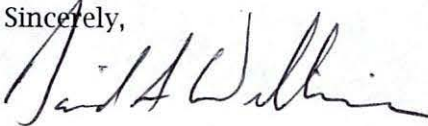
<https://www.tceq.texas.gov/drinkingwater/trot/exception>

This letter is not to be construed as:

- A TCEQ-granted exception for a public water system to use the challenge tested cartridge filters as discussed in this letter;
- TCEQ approval for a public water system to install the referenced cartridge filters; or
- TCEQ approval for a public water system's required concentration time (CT) study.

If you have any questions about this letter, or if we can be of additional assistance, please contact David Williams, P.E., at the letterhead address, by e-mail at [david.a.williams@tceq.texas.gov](mailto:david.a.williams@tceq.texas.gov), or by telephone at (512) 239-0945.

Sincerely,



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