September 18, 2012

Robert Jones
Chemical Control Division
Office of Pollution Prevention and Toxics
U.S. Environmental Protection Agency
1200 Pennsylvania Ave, NW
Washington, DC 20460
Via Email: *jones.robert@epa.gov*

Re: Enforceable Consent Agreement Negotiations for Two Cyclic Siloxanes

Dear Mr. Jones:

The National Association of Clean Water Agencies (NACWA) is providing these comments as an interested party in the enforceable consent agreement (ECA) negotiations to collect environmental monitoring data for octamethylcyclotetrasiloxane (D4) and decamethylcyclopentasiloxane (D5). NACWA has been participating in the ECA discussions about these two siloxanes that began on June 27 and has reviewed the proposals that have been made for the ECA by the Silicones Environmental, Health and Safety Council of North America (SEHSC) and EPA, including EPA's September 6 proposal. Our comments address aspects of the proposals' recommended sampling efforts for publicly owned treatment works (POTWs), as well as other questions that EPA has asked about the effects of siloxanes at POTWs.

The ECA negotiations on POTW sampling have focused on the number of POTWs that should be included in the data collection effort and the factors that should be used in determining which POTWs should be sampled. In its September 6 proposal, EPA recommended 16 POTWs for the study, while SEHSC recommended five in its original proposal. NACWA recommends sampling at seven or eight POTWs, to potentially include two POTWs that use lagoon treatment and five or six POTWs that use activated sludge treatment. NACWA believes that data collected from seven or eight POTWs, when combined with other existing data sources, should provide EPA with sufficient data for an environmental risk assessment of D4 and D5.

NACWA's publicly owned wastewater treatment agency members are interested in this data collection effort because of the detrimental effects of siloxanes on the exhaust stages of combustion equipment when biogas is used as a renewable fuel

National Association of
Clean Water Agencies
1816 Jefferson Place, NW
Washington DC 20036-2505
p 202.833.2672 f 202.833.4657
www.nacwa.org · info@nacwa.org

source, as well as the potentially harmful effects of siloxanes that may be released into the environment from wastewater effluent or biosolids. While NACWA recognizes that the problems associated with combustion equipment are not part of EPA's environmental risk assessment, the Association believes that the data collection for the risk assessment will provide useful information for addressing this issue in the future.

Proposals for the Enforceable Consent Agreement

The proposals made by SEHSC and EPA for sampling at POTWs include measurements of D4 and D5 from the POTW influent, effluent, and biosolids, as well as surface water, sediment, and biota in the receiving waters. Air monitoring was also proposed for one POTW. The negotiations to date have focused on the factors that should be considered for selecting POTWs and determining how many POTWs that should be sampled. NACWA has the following comments on these issues.

Population Size Served by the POTW

By sampling POTWs, EPA would like to determine the contribution of siloxanes to POTW loading from domestic sources and has suggested that population size could provide information about these domestic contributions. NACWA agrees that quantifying domestic sources is important, since D4 and D5 are used in a wide range of consumer products and POTWs have no ability to regulate chemical discharges from domestic sources. However, NACWA disagrees that population size would provide the appropriate information. There is no basis for believing that use of products containing D4 and D5 will be dependent on the population served by the POTW. A better measure of the domestic source contribution of D4 and D5 would be the proportion of influent to a POTW that comes from domestic sources. In addition, the type of industrial discharges to the POTW must be considered. If a POTW has significant influent from industrial sources that do not discharge siloxanes, the domestic sources will be diluted. Conversely, the influent concentrations of D4 and D5 will be increased over what is expected from domestic sources if there is a significant contribution from industrial sources.

EPA's September 6 proposal states that "All monitored POTWs should have a low industrial contribution to influent (<10%)." NACWA agrees that the industrial contribution should be as low as possible, and the maximum 10 percent value for industrial contribution is a realistic goal for selecting POTWs.

For POTWs with combined sewers, which convey both wastewater and stormwater, the influent will also be affected after precipitation events, and potentially much longer if the POTW stores stormwater to treat over time. This should be taken into account for any sampling that occurs at POTWs with combined sewer systems. Also, even separate sewer systems, which are not meant to collect stormwater, can have infiltration of groundwater into the sewer pipes and inflow of stormwater from illegal connections to the sewer. This infiltration and inflow from precipitation events dilutes the wastewater before it reaches the treatment plant. These factors must also be considered when determining the amount of influent from domestic sources.

Treatment Method Used by the POTW

NACWA agrees with EPA that the focus of the sampling should be on POTWs that use secondary treatment. Furthermore, NACWA recommends that the proportion of treatment processes used by the POTWs sampled for the ECA be similar to the proportion of the amount of wastewater treated with these processes in the U.S. SEHSC's original ECA proposal included sampling at five POTWs: two with activated sludge treatment, one with oxidation ditch treatment, one with trickling filter treatment, and one with lagoon treatment. This sampling would not reflect the proportion of wastewater treated with these methods in the U.S. EPA's

September 6 proposal, with sampling at 12 POTWs using activated sludge and four POTWs using lagoons, is a more realistic proportion of the treatment types used in the U.S.

Flow Rate of the Receiving Waterbody

Predicting the receiving body flow rate for a POTW may be difficult in some cases, since the flow rate may depend on recent events and the time of the year that the sampling occurs. Receiving body flow may depend on the amount of precipitation, any runoff from snowfall melt, and use of the water for other purposes, such as irrigation. Based on the chemical properties of siloxanes and previous studies of siloxanes at POTWs (e.g., Wang et al., 2012), the removal rates of siloxanes at POTWs are expected to be very high, with the majority of influent siloxanes expected to partition to the biosolids. The concentrations of siloxanes in the effluent are expected to be very low. While the flow rate of the receiving waterbody should be considered in the analysis of the sampling results, its unpredictability and the likely low discharges of siloxanes to the receiving water body mean that it should not be used as a deciding factor in choosing POTWs for sampling. Evaluating the impacts of this factor would be best accomplished by conducting sampling at the same POTW at different times of the year, as EPA has recommended in its September 6 proposal.

Additional Factors of Interest

EPA states in the September 6 proposal that "there would be value in sampling at several POTWs that discharge to a receiving water body with high organic content," but "it would be difficult to identify POTWs for potential monitoring based on this factor." NACWA agrees that organic content of the receiving water body should be used in the analysis of sampling results, but should not be used as a basis for choosing POTWs for sampling.

NACWA also agrees with EPA that "environmental conditions in different parts of the country could affect the partitioning and sedimentation of siloxanes." The POTWs chosen for sampling should be geographically diverse, but it is not necessary to determine a specific number of POTWs in different regions of the country.

Sampling Details

NACWA agrees that two sampling events at each site are sufficient for this study. In addition to sampling of POTW influent, effluent, biosolids, sediment at outfall, and surface water, biogas produced at the POTW should also be sampled.

EPA has proposed sampling at 16 POTWs, while SEHSC has proposed sampling at five POTWs. EPA's sampling plan matrix includes population served and dilution level (based on flow rate of the receiving water body). However, as explained above, NACWA does not believe that these factors are relevant. Furthermore, there is no justification given in the EPA proposal for the four-by-three size of this matrix. Sampling at only five POTWs, as proposed by SEHSC, would not provide sufficient data to evaluate unusual or outlying results, especially with only two of the five sites using activated sludge treatment.

NACWA recommends using available data when determining the number and type of POTWs that should be used for sampling. Sampling at four POTWs with lagoon treatment, as recommended by EPA, is excessive due the small proportion of U.S. population served by POTWs with this treatment type and the available data in the Wang et al. (2012) study of Canadian POTWs. In this study, seven POTWs with lagoon treatment were sampled. EPA states in its September 6 proposal that "it is likely that the Canadian sites are not representative of U.S. POTWs." NACWA disagrees with this assessment and believes that the Canadian data for lagoons are

consistent with other studies of siloxane behavior at POTWs. The number of lagoons sampled for EPA's risk assessment should therefore be reduced.

NACWA recommends sampling at seven or eight POTWs to provide enough data to evaluate the behavior of siloxanes at POTWs and the factors influencing this behavior. This number could include two POTWs that use lagoon treatment if EPA believes that it is necessary to verify the Canadian data. Five or six POTWs that use activated sludge treatment would allow evaluation of the variability of the data.

Additional Comments

Neither the EPA nor SEHSC proposals consider septic tanks. Since approximately 20 percent of the U.S. population uses septic tanks for their wastewater treatment, and this method of treatment is vastly different from treatment at POTWs, EPA's risk assessment should consider environmental exposure to siloxanes from septic system treatment.

Costs Associated with Siloxane Removal at POTWs

EPA asked NACWA to provide more information about the costs incurred by POTWs that use biogas as a renewable fuel source and must remove siloxanes from the biogas to prevent damage to combustion equipment. The following information on costs has been provided by NACWA members.

- The Great Neck Water Pollution Control District in New York is installing two 65 kW microturbines that will convert methane gas from the anaerobic digesters to electricity with the by-product of hot water. As part of the microturbine system, the utility must install a siloxane stripping unit which is approximately 30 percent of the cost ($285,000) of the microturbine project and will require the majority of the maintenance costs.

- Metro Wastewater Reclamation District in Denver struggles with heavy siloxane deposition on the heat exchangers that are located in the exhaust stacks of its combustion turbines. Rather than assume the expense of gas treatment to remove siloxane, the utility shuts down its cogeneration facility about once every three to four months to physically remove the siloxane from the heat exchanger coils using a high-pressure water spray. The shutdown takes about 6-7 hours. The shutdowns are inconvenient, but currently cost less than gas treatment.

- The Hampton Roads Sanitation District (HRSD) in Virginia has designed a project with construction completion expected in 2013. The Atlantic CHP (combined heat and power) project has two 1100 kW Cummins gas fired engines that will burn treated digester gas and includes Applied Filter Technology, Inc.'s SAG Pack System for siloxane removal. Moisture and hydrogen sulfide (H_2S) removal is also done to protect both the engine and the siloxane removal media. The entire CHP project construction cost is $7.6 million. The construction cost of the siloxane removal system itself is $300,000 (4% of total). HRSD is removing H_2S and moisture in order to protect the siloxane removal media and estimates that in total, $800K of the construction costs can be attributed to costs associated with siloxane removal.

- In early 2004, the City of Eugene, Oregon, installed the SAG Pack biogas filter system by Applied Filter Technology, Inc., which consists of two filters. The total project cost was $343,000. Eugene produces an average of 350,000 ft^3/day of digester gas, requiring the siloxane filter media to be changed every 18 months at a cost of $3,500.

- A NACWA member installed siloxane removal in 2011 as part of a larger project which included the addition of cogeneration equipment to utilize onsite biogas for power generation. Removal is achieved by passing the gas through a carbon media engineered specifically to remove siloxanes. It is part of a gas cleaning system which also includes H_2S removal as well as moisture removal. The gas cleaning system is installed ahead of two 1059 kW engines. The cost of the siloxane removal system alone was about $310,000 and about $580,000 for the entire biogas cleaning system. These are roughly 12% and 23% of the cost of the cogeneration portion of the project, respectively. Since the project has been operating for less than a year, the utility does not have optimized operation and maintenance costs yet. In particular, the siloxane media has not been changed yet, and this is expected to be a large maintenance cost. This year, the H_2S media was replaced for about $115,000, and the siloxane media is expected to cost more than the H_2S media. Labor, power, and maintenance were estimated at $120,000/year for the entire gas cleaning system.

- A NACWA member conducted a full-scale pilot of a reciprocating internal combustion engine exhaust treatment system consisting of digester gas clean-up and two post-combustion catalysts in series to reduce carbon monoxide (CO), oxides of nitrogen (NOx), and volatile organic compound (VOC) emissions. The pilot study was conducted to determine whether the challenges of working with biogas (namely, the presence of contaminants such as siloxanes and hydrogen sulfide) could be overcome in applying existing catalyst technology to biogas-fired engines. The pilot project's biogas cleanup system utilized an existing gas dryer (heat exchanger) plus a new fixed-bed gas cleaning vessel with a blend of activated carbon. Only initial cost estimates are available for this system at this time. It is estimated that the digester gas cleaning vessels capital cost is approximately 20 percent of the capital cost of the two post-combustion catalysts and building improvements to house the catalysts.

Thank you for your consideration of these comments. Please contact me at 202-533-1836 or *cfinley@nacwa.org* if you have any questions.

Sincerely,

Cynthia A. Finley, Ph.D.
Director, Regulatory Affairs