NORTH CAROLINA
Environmental Quality

Emerging Compounds

Background

You may have heard news recently about emerging compounds. Specifically, 1,4-dioxane and a group of chemicals known as perfluoroalkyl and polyfluoroalkyl substances (PFAS). Data reviewed as part of the U.S. EPA's UCMR (Unregulated Contaminant Monitoring Rule) has indicated elevated concentrations for these compounds in North Carolina waters.

The Water Quality Permitting Section is developing a management strategy to address some of these compounds in surface water and biosolids. General information on these compounds, along with recommended sampling protocols, are provided below.

What is 1,4-Dioxane?

1,4-dioxane is a synthetic industrial chemical that is highly miscible in water. Historically used as a solvent stabilizer, it is used currently for a wide variety of industrial and manufacturing purposes. 1,4-dioxane can be found in industrial solvents, paint strippers, and varnishes, and is a by-product of chemical processes to manufacture soaps, plastics, and other consumer products. 1,4-dioxane is "likely to be carcinogenic to humans" and has been found throughout the United States. The chemical is highly mobile and does not readily biodegrade in the environment.

The U.S. EPA has provided a Technical Fact Sheet on 1,4-dioxane which provides basic information on 1,4-dioxane at a glance.

What is PFAS?

Per- and polyfluoroalkyl substances (PFAS) are a large group of synthetic chemicals used globally in the manufacturing of thousands of common household and consumer products. These chemicals are resistant to heat and able to repel water and oil, making them useful for non-stick coatings, firefighting foams, food packaging, water-repellent fabrics, and more. While PFASs are useful for industry, they can be problematic in the natural environment. These chemicals are environmentally persistent and have some bioaccumulative properties, meaning that they do not breakdown in the natural environment, and can build up in blood and tissues over time, allowing them to be carried up the food chain. PFAS compounds that have been most studied are perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS). Studies of these particular compounds have demonstrated potential adverse health effects, including links to increased cholesterol, hormonal changes, decreased fertility, and cancer risks.

The U.S. EPA has provided an infographic regarding PFAS compounds called PFAS What You Need To Know.

Criteria

North Carolina has a calculated human health surface water criterion with an estimated excess lifetime cancer risk of one in one million at a concentration for 1,4-dioxane of 0.35 micrograms per liter (µg/L) in water supplies and 80 µg/L in all other waterbodies (15A NCAC 02B .0208).

Criteria are still in development for PFAS compounds. The EPA drinking water health advisory for PFOS and PFOA is 70 nanograms per liter (ng/L) (individually and combined). While 70 ng/L is not a permit limitation, it is DEQ's objective to protect downstream drinking water intakes in accordance with NC Surface Water Quality Standards (15A NCAC 02B .0203).

Sample Collection and Analysis

To locate a lab certified to perform 1,4-dioxane analysis using EPA Method 624.1, please visit our certified laboratory listings on DEQ's Water Sciences page. 1,4-dioxane samples should be representative of the typical wastewater flow to your facility and should be collected as grab samples.

To locate a lab capable of performing the PFAS analysis, please visit the US Department of Defense Accredited Labs Search tool and search by method "PFAS by LCMSMS Compliant with Table B-15 of QSM 5.1 or Latest Version." For reference, a list of labs DWR-Water Quality Permitting has confirmed are acceptable to conduct PFAS analysis has been included below. PFAS samples collected should be representative of the typical wastewater flow to your facility and shall be collected as grab samples.

The probability of false positives is relatively high during PFAS sample collection due to the potential for many sources of cross-contamination, combined with low laboratory detection limits (nanograms per liter (ng/L) or parts per trillion (ppt)). Please take precautions to avoid products that could introduce cross-contamination to the sampling environment.

Actions Taken

Ambient stream monitoring has been conducted for 1,4-dioxane in the Cape Fear River Basin since October 2014. DWR's Water Sciences Branch has summarized the results of the study which can be found here.

Future Actions

Data reviewed as part of U.S. EPA's UCMR (Unregulated Contaminant Monitoring Rule) has indicated elevated concentrations for these compounds in the Cape Fear River Basin. In addition, ambient monitoring performed by DWR's Water Sciences Section have confirmed the presence of these compounds in the Cape Fear River Basin. In an effort to assess the levels of these contaminants throughout the Cape Fear and to assist DWR in developing a management strategy to address and reduce levels of these emerging contaminants, publicly owned treatment works with approved Pretreatment Programs in the Cape Fear River Basin will be required to perform investigative monitoring at the treatment plant for 1,4-dioxane and total PFAS monthly for three consecutive months starting in July 2019. A technical information session will be held in May 2019 and will be limited to Pretreatment Program POTW staff. Further investigations may be required in other River Basins as additional data is acquired.

Additional Information

Third Unregulated Contaminant Monitoring Rule (UCMR3) Data
Ambient 1,4-dioxane Sampling 2016 Report
Ambient 1,4-dioxane Sampling 2017 Report

Labs approved by NCDEQ-DWR for the PFAS Wastewater Influent Screening Sampling:

(Note: Most labs on this list are also listed on the Department of Defense accredited list approved for PFAS testing using LCMSMS with Isotope Dilution, found by visiting https://www.denix.osd.mil/edqw/accreditation/accreditedlabs/ and searching by method "PFAS by LCMSMS Compliant with Table B-15 of QSM 5.1 or Latest Version".)

ALS Environmental – Kelso 1317 S. 13th Avenue Kelso, Washington 98626 (360) 577-7222 http://www.alsglobal.com/	Maxxam Analytics International Corp 6740 Campobello Road Mississauga, Ontario L5N 2L8 (905) 817-5700 http://maxxam.ca
APPL, Inc. 908 N. Temperance Avenue Clovis, CA 93611 (559) 275-2175 http://www.applinc.com/	Microbac Laboratories, Inc. – Ohio Valley Division 158 Starlite Drive Marietta, OH 45750 (800) 373-4071 http://www.microbac.com/our-laboratories/marietta-ohio/
Alpha Analytical 8 Walkup Drive Westborough, MA 01581 (508) 898-9220 http://www.anab.org/	SGS AXYS Analytical Services Ltd. 2045 Mills Road W. Sidney BC, Canada V8L 5X2 (250) 655-5800 http://www.axysanalytical.com/
Battelle 141 Longwater Drive, Suite 202 Norwell, MA 02061 (781) 681-5565 http://www.battelle.org/	*SGS North America, Inc. – Orlando 4405 Vineland Road, Suite C15 Orlando, FL 32811 (407) 425-6700 http://www.sgs.com/
*Enthalpy Analytical 2714 Exchange Drive Wilmington, NC 28405 (910) 212-5858 https://enthalpy.com/	Shealy Environmental Services 106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 http://www.shealylab.com
Eurofins Lancaster Laboratories Environmental 2425 New Holland Pike Lancaster, PA 17601 (717) 656-2300 http://www.lancasterlabs.com/	TestAmerica – Sacramento 880 Riverside Parkway West Sacramento, CA 95605 (916) 373-5600 http://www.testamericainc.com
GEL Laboratories, LLC 2040 Savage Road Charleston, SC 29407 (843) 556-8171 http://www.gel.com	Vista Analytical Laboratory 1104 Windfield Way El Dorado Hills, CA 95762 (916) 676-1520 http://www.vista-analytical.com
Gulf Coast Analytical Laboratories, Inc. 7979 Innovation Park Drive Baton Rouge, LA 70820 (225) 767-5717 http://www.gcal.com/	

* denotes labs approved by NCDEQ-DWR to run the DoD compliant method regardless of accreditation status and/or are approved to run a variation of the DoD method.